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## EDITORIAL NOTES.

### Encouraging Small Investors—Industry and the War Loan.

IT may perhaps raise a gibe in outside quarters, but truth can stand it, when we claim that what Parliament in the present emergency sees, the gas industry, or a section of it, saw some time since—that is, the importance of encouraging the small investor, and therefore thrift. Until the new war loan came out, the Government had never done anything special, or of real value, to encourage thrift and the small investor. The thrift there has been among the working class has had no other incentive than self-protection; and all the Government have done has been to provide a safe place in the shape of the Post Office Savings Bank for the deposit of the money put by, and paying for the huge aggregate of savings a low rate of interest. The encouragement of thrift by paying a decent rate of interest to the thrifty part of the working class has not hitherto occurred to the Government, or, if it has, it has not been one of their methods. While the man in a better pecuniary position could safely invest his money to secure for him round about 5 per cent. interest, the man of restricted means and small opportunities for investing has had to be content through the Government with an interest of approximately half the amount. There was no encouragement in this. But under the new war loan, through the scheme of 5s. vouchers which carry interest at 5 per cent., and the bond to which the vouchers will be converted when the amount has accumulated to £5, and which will bear 4½ per cent. interest, the workman with his small savings and capital is placed on a level with the more affluent—the money of the one is as good as that of the other; and the loan offers the opportunity to all who have money to invest, whether small or large amounts, to share and share alike in the matter of interest. There is an especial advantage in giving all who are in the position to take it an opportunity of showing a pecuniary patriotism; and there is also national advantage in doing something more than has ever been done before in encouraging thrift among the working classes by ensuring a fair and respectable rate of interest on their savings.

Industry and commerce are the foundation of national prosperity; but the man with small savings has had but poor encouragement to do his share in enlarging that foundation by investing in industry, and feeling thereby that he has a monetary stake in the country. Every encouragement ought to be held out to him in this connection. The co-partnership schemes of the gas industry have recognized this; and through them thrift has been very materially encouraged, and the desire to become larger and larger stockholders has been stimulated. Sir George Livesey, with his great prescience and knowledge of human nature and affairs, recognized this many years ago. What he then saw has been fulfilled. His expectations were exceeded before he passed away; and every year since the memorial to success, and therefore to his memory, has grown to more and more substantial proportions. Every gas co-partner, whatever the amount of his investment, gets the same rate of dividend as the man holding hundreds or thousands of pounds of capital. The inducement to saving supplied by equality in this respect is great. The Government have a fine suggestion and opportunity here, if only they would utilize them, by developing some scheme by which the working people of the country could in ordinary times invest small sums in sound undertakings of the country—that is to say, those workers who are not engaged in an industry where they can directly invest their savings—and realize for their money the same rate of dividend as larger investors. The element of safety, of course, comes in. It is a factor that is of importance to the working man, whose investments are his savings, the loss of which would permanently cripple him, and be a standing source of discouragement. But it ought to be a matter for the Legislature to do something towards assuring security. Such a piece of work would be, in our opinion, of greater national importance than certain of the so-called domestic schemes which the Government have during recent years seen fit to force through Parliament against a considerable mass of hostile public opinion; and it would be of general advantage to industry, to the workers, and therefore to the nation at large. The skilled worker during the years anteceding the war was being paid higher wages than he had ever received. The cost of living, it is true, was then somewhat higher than previously; but his capacity for saving was, in those years, greater than before, if only he had been encouraged to exercise that capacity to the full. We do not want to create a nation of misers. Thrift and saving will not do it. Money begets money; and the circulation of money grows the greater the earning power developed by profitable investment.

Parliament has allowed special powers to gas undertakings of the co-partnership class, to enable them to encourage investment of savings by their own employees. But the same advantage in the matter of investment is not afforded the outside working man. He can buy small quantities of industrial stock in the open market or take a small share in the issue of fresh capital. But the obstacles to the would-be working-man investor are many in doing this. He wants to have his opportunities advanced well before the actual stage of investment, so that there is a connection between the saving stage and the investing stage—an investing stage which will give him the same rate of dividend as is secured by the larger investor. That is where legislation is wanted. We know that some gas companies have the right to offer new issues of stock to their consumers in small amounts; but new issues of stock are not in many cases of frequent occurrence. The small investor wants to invest when he has the money; but he fights shy of stockbrokers, commission, contract stamps, transfer stamps, and registration fees. The means for making small investments, and the charges associated therewith, require to be simplified. Some charge would be requisite; but it wants easing and consolidating.

Regarding new issues of gas stock, the authorities who rule at Westminster prefer to stick to form rather than consider any new proposition on its merits from the public point of view, and then, if it commends itself, to legislate accordingly. Localities vary wonderfully in their capital investing capacity; but the powers that be are unwilling to relax even the auction clauses, though shown that a locality is low in rank in its investing capacity, and that more small investors would be attracted by the relaxation. They prefer to cling tenaciously to the form of clauses as cast. In the case of the Spennymoor and Tudhoe Gas Bill, the Company asked for an extension of the time within which the amount of stock purchased under the auction clauses must be paid up. The standard is three months. When the matter was before the Unopposed Bills Committee recently, Mr. H. R. Cripps (Messrs. Dyson and Co.) asked that, in the case of this Company, the period might be extended from three months to twelve. The reason he gave was that the stock of the Company is held almost entirely locally in small amounts, and that the limitation of three months tends to restrict the market among the working classes. The Committee declined the extension; not being prepared to create a precedent. This is not the way to encourage the small investor. Compare this decision with the scheme of the Chancellor of the Exchequer of 5s. vouchers for encouraging the working man to invest in the new war loan! What possible difference could it make to anyone—to Parliament or to anyone else—save the small local investor, whether the Spennymoor and Tudhoe Gas Company were allowed twelve months or three months within which to spread the payments for purchases of stock. The duty of Parliament is not to cripple

the means to a good end, but to facilitate them; and the encouragement of small investments by the poorer section of the community we regard as an exceedingly good object in the interests both of the individual and of the nation generally.

There is no question that the unlimited amount of the war loan will have its effect on the immediate future capitalizing of industry. This has been anticipated; and the Treasury has prepared industrial concerns for it by the veto it now exercises (and will continue to exercise until a year has expired after the war) over fresh capital expenditure. There can be little doubt, too, that a loan, with 4½ per cent. interest guaranteed by the Government and repayment of the principal at par, will depreciate for at any rate a time the market values of industrial stocks. The one thing that industrial undertakings may do, if the boards think it an advantage, will be to exchange the investments of any of their funds which may be in low-interest bearing Government securities, such as Consols, into the new war loan—that is to say, if they are not likely to want the money, but only the dividends, till the Government redeems the stock at par. But conversion rights are only in proportion to the purchase of war stock; and for this not many industrial concerns will have the cash to spare under present conditions. Reserve investments in gilt-edged securities have already been largely written-down by most gas undertakings; and there is no doubt that the low-interest carrying stocks will depreciate still further with the issue of this 4½ per cent. Government loan. As a matter of fact, there can be, in our time, no return of the day for fixed low-interest bearing stocks. There is no help for it. The Government must have the money; and they had to make the loan as attractive and as secure as possible.

## Coal Supplies and Price Regulation.

The position in regard to coal continues unsatisfactory; but there is better promise now of the Government intervening for the purpose of enlarging supplies, so as to compensate for the deficiency due to the number of miners away at the front, as well as of producing price regulation. It is now recognized that any shortage of supplies of coal might imperil the production of high explosives and other ammunition, and war materials generally; and Mr. Lloyd George, as Minister of Munitions, has said that it is of fundamental importance that there should be a considerable increase in the output of coal. The coal miners' representatives have given their assurance that there shall be no lack of effort on their part to bring to the surface all the coal that is required. If we may take it this is the decision of the men, then they may be relied upon to keep to their promise under the present conditions. But curiously enough while report says they are willing to pledge themselves in this manner, they are unwilling, at the moment at any rate, to fall into line with other labour unions and employers in agreeing that, during the war, there shall be no strikes, and that all disputes shall be subject to compulsory arbitration. There seems to be a lamentable want of trust in the coal industry between employers and employed. It is hoped, however, that, after the joint conference arranged to take place in London on July 7 between the coalowners and the miners (when Mr. Lloyd George will address them regarding the Government and national requirements), there will be a clearing-away of all mistrust, and a resolve to united and hearty working to put the country in a position of complete security in respect of the basic necessity. It is singular, however, that such a conference should be needed. What the country needs today in respect of coal appears to be so obvious that it does not call for talk to make it more so. Moreover, time is passing. Every week now reduces the number of days of minimum requirement, and brings us a week nearer to the days of maximum requirement, which form the period, unless large stocks are promptly accumulated, towards which all, especially those engaged in the industries of the country, are looking with some fear, which will only be abated by a considerable turn of the tide in the matter of deliveries and stocks. We cannot say that stocks are not improving. They are; and part credit for this must be given to the reduction of exports. But we are at Midsummer; and several gas-works (only representative of others) report stocks largely behind the normal at this period.

As to price regulation, matters have reached a position now when the Government must take action, although they would have preferred the coalowners to voluntarily move in the matter. It is understood that there has been an abortive ending to the conferences between the Board of Trade and the coalowners and merchants respecting household coal prices; and there have since been all sorts of rumours current respecting the intentions of the Government. Mr. Runciman (who stated at West Hartlepool on Friday that the Government could not allow the price of coal to remain at its present enormously high level), it is expected, will make an announcement on the subject in the House early this week as to what the Government have resolved to do in the matter of price regulation to the "public." The term "public" is an elastic one; and we hope that, in this instance, it includes industry. If so, the Government will have strong support from the Committee (named last week in our first editorial) appointed by the conferenee of members of Parliament and the delegates from the joint conference of the gas and electricity industries held early in May. Those present at the latter conference did a good piece of work when they set the ball rolling which ended in the enlisting of the sympathies of a representative and influential number of members of Parliament in the cause of saving the country from a worse plight next winter than it was in last winter. A third meeting of members of Parliament was held last Tuesday, when, as reported in another column, resolutions proposed by the Committee were, with slight amendment, adopted. The coal industry must now look upon these resolutions not as emanating alone from the Committee, but as representing the views of a considerable number of members of Parliament. The first resolution suggests to the Government that the maximum pithead prices should be those for substantial quantities of each class of coal sold during the twelve months preceding the war, with an addition of 4s. 3d. per ton, or such other sum as may be prescribed to cover the increased costs owing to the existence of the war. The second resolution proposes that the same lines be taken in regard to the regulation of freightage for coal. The third resolution urges regulation of the prices charged by the coal merchant.

There is no apparent reason, nor have we observed any sound argument, as to why these resolutions should not commend themselves to the Government. There is fairness in the lines of the proposals; and there is no doubt the Government have realized this. Both action and word show it. There are the efforts of the Board of Trade to govern prices in London as between merchant and householder; and in the recent discussion in the House on the prices of commodities, the President of the Board of Trade pointed to the basis of regulation incorporated in the resolutions being the one that might be contemplated by the Government in the event of the coalowners of their own volition not making a move to prices that are reasonable under the extraordinary and artificial conditions of the times. If the principle of regulation and the basis of charge are right in the circumstances for coal—and we think they are—then they are likewise for freights.

We are not in the secret as to how the allowance of 4s. 3d. extra costs per ton were arrived at by the Committee. But it may be taken that, with coalowners on the Committee possessing actual experience of the additional costs in the coal-fields, there are good grounds for the belief that the figure is sufficiently generous. Other coalowners will probably not agree. But we do know, as Mr. Runciman pointed out the other day, that 1s. 6d. has been added to not a few pithead prices in consideration of the war bonus, which, the "Iron and Coal Trades Review" has computed, represents in the federated areas an extra charge of 7d. or 8d. per ton; and prior to that it was variously estimated that the additional colliery costs attributable to the war were covered by from 1s. 6d. to 2s. per ton. So that anyway the 4s. 3d. per ton supplies more than ample cover. From 5s. to 6s. is generally spoken of as about the extra pithead price that is now being paid for Yorkshire coal under new contracts. Contracts for Durham gas coal (the average prices of several of which are before us) vary considerably in the additional figures over the prices paid in 1914-15. Differences of quality have something to do with this; and so too may the prices for the 1914-15 contracts. There is one gas undertaking with an average pithead price per ton for Durham coal, for 1915-16, 7s. 3d. higher than the average of its contracts for similar varieties in 1914-15, when the average was lower than the prices paid by certain other concerns. Then another undertaking, which probably made its contracts earlier than the other, fixed up at prices averaging 3s. per ton higher than for 1914-15; but its prices for 1914-15

contracts were something like 2s. in excess of the other undertaking. The two undertakings (only samples out of a number which we could quote) are situated in widely separated parts of the country; and the differences in price rather represent the differences in time when the contracts were effected than any appreciable difference in qualities. But the average pithead prices that are being paid by them for next year's contracts differ by about 2s. per ton.

We take it that it is not suggested that the proposal as to the 4s. 3d. limit over 1914-15 prices should be retrospective, but would only, if agreed to by the Government and confirmed by legislation, apply to contracts subsequently entered into. It may be suggested that any contracts now made, unless considered reasonable by the purchaser under the circumstances, should include a clause to the effect that the contract price is subject to any Government measure providing for a restriction of the excess price over the prices of 1914-15 for (as the resolution puts it) "substantial quanti-"ties of each class of coal." It seems to us that, in this provision for arriving at standard figures for 1914-15, ground would be found for some dispute.

## Combination for Scientific Manufacture—Sulphate of Ammonia.

If anything, more interesting than usual is the part of the report in which we are specially concerned of the Chief Inspector under the Alkali Works Regulation Act (Mr. W. S. Curphey). The war has affected prejudicially on the one hand and beneficially on the other the classes of work that the department have under surveillance, just as it has affected most other mundane affairs. But there is one thing that is extremely satisfactory, and it is that, the war and abnormal conditions notwithstanding, and the severance through loyalty to King and country of skilled men from the operation of chemical processes, there has been no cause for serious complaint as to contravention of regulations. In this we see the effects of improved plant and methods, and of the cultivation of a higher control over the processes—this in no small measure due to the helpful influence that is brought to bear through the Chief Inspector and his district associates. Even in connection with the manufacture of sulphate of ammonia, Mr. Curphey discerns a distinct tendency to a higher standard of working—partly through the economy and larger yields effected by the preservation of ammonia in dealing with and storing the liquor, partly to the adoption of new and improved plant, and partly to closer attention to details generally. He looks for still higher results; for in alluding somewhat cryptically (in the absence of complete working data) to direct process sulphate of ammonia plants that have been installed in certain gas-works, he speaks of anticipations of higher yields per ton of coal carbonized as compared with the older systems.

There has been a decided awakening of interest among manufacturers in the direction of improving the make—quantitatively and qualitatively—of sulphate of ammonia; and Mr. Curphey realizes this. At the same time, he counsels that, while much closer attention is being given to raising and maintaining the standard quality of sulphate of ammonia to the figures advised by the Sulphate of Ammonia Association, there should be considered and investigated, in parallel, questions bearing upon the costs of manufacture, with the object of obtaining the best product at the lowest possible expenditure. The advice is good, in view of what will happen after the war when the surplus stock of sulphate of ammonia in Germany will be thrown on to the market, and the competition will reopen of the synthetically produced commodity, at a price bidding for favour. It may be doubted whether Germany has during the war been doing much in the production of the synthetic brand, seeing that the huge Company interested in the process have (so it is understood) been straining all their resources in the production of high explosives and chemicals required in connection with the war. So far as we know, the same Company may have been doing their share in the barbarous work of introducing into warfare the use of gases which had such ghastly effects upon our and our Allies' men. But this by the way. There will undoubtedly be severe competition after the war; and, though Germany has by its conduct of the war done itself immense injury in the eyes of all civilized people, in the end it will be quality and price that will win commerce outside our and our Allies' countries, and not the current feelings of detestation, which are not likely to live and have effect eternally.

Mr. Curphey asks all concerned to recognize what will happen in this matter of competition, and to "gird their "loins" by co-operative scientific work on the productive side. "It is a matter for serious consideration whether there is "not scope in various directions for more centralized scien-"tific guidance of industry, and whether questions relating "to cost of production, recovery, and utilization of waste "material, improvement of product, &c., might not be con-"sidered by a capable scientific adviser." Already many industrial undertakings carry out, with good result, work of this kind; and we do not understand that Mr. Curphey suggests that, whether in sulphate of ammonia or any other chemical manufacture, such work should be superseded. Rather his view appears to be that there is room for co-ordination of quality of product where British reputation may suffer abroad through inequalities of British output from different works. We know, through circulars sent out by the Chairman of the Sulphate of Ammonia Association (Mr. D. Milne Watson), how this commenced to happen before the war in the case of sulphate of ammonia, owing to material of higher standard in respect of ammonia, and lower content of moisture and free acid, being put in competition from Germany with British sulphate of ammonia of lower standard quality in ammonia and containing higher percentages of acid and moisture. In such cases, the Chief Inspector considers that central supervision and control are desirable, in face of the severe *post*-war competition that will be experienced in connection with the various chemical industries of this country, in order that there may be equality of product, and that the technical trend of the competition may be competently watched. There are many difficulties in the way of accomplishing this—"of bringing into line "the existing varying and conflicting interests, and of modi-"fying the mental outlook in some cases." It is the "mental "outlook" that is the greatest trouble of all. The "mental "outlook" of some people appears to form a sort of impregnable barrier to advances being made in the industrial efficiency that is necessary to victory in the great commercial war with organized forces which lies before us. It is vital to success that nothing shall be left undone to promote this efficiency, which means the best quality, produced by the most economical means, and therefore at the lowest cost. The scientific aid suggested by Mr. Curphey—scientific aid with a foundation to it of practical experience—is one of the means by which what is vital to the future can be attained.

Turning for a moment to the statistics as to sulphate of ammonia production officially published by Mr. Curphey, these may be looked upon as the correction of the approximate ones published last January by Messrs. Bradbury and Hirsch, and which, considering the heavy and scattered quantities dealt with, are remarkably close estimates. The increase of sulphate of ammonia plants during the year was 31; making a total of 680. The total production of sulphate was 426,412 tons, which was a reduction of 6206 tons upon the total of 1913, and is a better result, by about 5000 tons, than the 11,000 tons reduction suggested by the figures published in January. We almost owe an apology to the authors of the earlier figures for questioning their suggestion that gas-works showed a reduction of about 5000 tons in the year's output. The official figures disclose that their actual output—being 175,930 tons—was 6250 tons less than in 1913. Iron-works, in producing only 16,008 tons, established a loss of 3948 tons; while shale-works, with a production of 62,749 tons, were only 312 tons short of the level of the preceding year. Messrs. Bradbury and Hirsch were under the impression (this is where their data went most astray) that coke-oven works, producer-gas plants, and other carbonizing works had receded in output by about 4000 tons. As a matter of fact, Mr. Curphey gives the coke-ovens credit for a production of 137,430 tons, which is an advance of 3614 tons on 1913, and to the credit of producer gas and carbonizing works he places 34,295 tons, which is an increase of 690 tons. Relative to the fall of production by gas-works during the year, Mr. Curphey supplies reasons for this in the street-lighting restrictions and the prevailing general economy. Another cause, of course, was the large increase of carburetted water gas made owing to the difficulties experienced with coal deliveries.

## Private Generating Plants and Public Advantage.

The Unopposed Bills Committee, as was seen by our "Parliamentary Intelligence" last week, gave quite a proper decision relative to the above matter in connection with the Spennymoor and Tudhoe Gas Bill. There are

certain gas undertakings with power to hire-out engines, dynamos, &c.; and the Spennymoor Company are desirous of possessing the same power. The Speaker's Counsel (Mr. Ernest Moon, K.C.) was rather opposed to the inclusion of dynamos—questioning whether gas undertakings should be authorized to deal in anything except apparatus necessary for the purpose of consuming gas. Poor gas undertakings! There seems to be in some quarters a dead-set against them having any power which will allow them to do business outside certain hard-and-fast limits, though the business is of public and economic advantage.

Mr. Moon asked, If a dynamo is supplied in this way, why not a steam saw? The analogy is not very clear. The "saw" is not required for the purpose of producing steam. Many large consumers of electricity now know that they can generate current by private plant at a cheaper over-all rate for lighting and power purposes than that at which they can purchase from the local electricity suppliers; and in the cause of economy, nothing should be put in the way of them doing this. They go to the gas suppliers, and say they want to hire plant for the purpose of generating current. The gas-engine is incapable of performing this duty without it is accompanied by a dynamo. Therefore, gas undertakings ask for the right to supply what is an integral part of the plant necessary for the generation of electricity, using gas as the motive power. Gas suppliers do not seek power to intrude beyond the electricity producing plant. They do not ask for the right to supply any machine tools, lifts, lamps, or anything else for which the energy may be required. These are distinctly things for the consumer. In this explanation perhaps Mr. Moon may find the answer to his question, "Why not a steam-saw?" The Committee were not with Speaker's Counsel in this matter, and allowed the clause to stand; thus subscribing to the law of public convenience rather than to useless restriction.

Just in the same way all the fight arose over the residual products restriction, which proposed to place in the hands of the chemical manufacturers the sole purchasing right, instead of maintaining an open market, for the secondary products of coal carbonization for gas production—the same open market that exists for the coke-oven industry and the chemical manufacturers. To-day with their secondary products the gas industry is performing a valuable work for the nation in the supply of toluol, carbolic acid, and sulphuric acid for war purposes, and intermediate products for the industries requiring dyes. If the obstructionists to the gas industry's free trading had had their way, and if preceding the war the original residuals restriction had been applied to the whole industry, its freedom and capacity for now helping the nation would have been affected. The blame for this would have rested upon those who, with too great willingness, danced to the tune that the chemical manufacturers chose to pipe. After this, we hope that the Private Bill Authorities will give broader consideration to a matter in which freedom of trade is a national advantage. The chemical manufacturers are well able to take care of themselves in open markets, and so is the electricity industry. Public advantage and economic considerations ought always to have first claim upon our legislators.

## The Unjust Burden at Manchester.

It is true the Manchester Corporation Gas Department is in a strong financial position; but this does not excuse the Council for inflicting unjust burdens upon the consumers, who alone have supplied the means, coupled with keen executive working, for making the position what it is. In the last financial year, the undertaking had to meet, through the war and other causes, the adversities which were the lot of all gas undertakings—adversities to do with markets and increased charges, and not in any way owing to any deficiency in technical or commercial management. The result was that the gross profit dropped to £90,787, of which interest absorbed £39,628—leaving the net profit at £51,159. This sum is totally inadequate, through no fault of the consumers (who are to pay an extra 6d. per 1000 cubic feet from June 24), to meet the obligations of the department and the £50,000 which the Council resolved should be contributed to the City Fund. The obligations were £67,011 for the sinking fund and £10,454 for works' extensions; so, with the £50,000 for the City Fund, there is a deficit of £76,306. To partially meet this, the reserve fund has been robbed of its balance of £23,597; and next year it starts with an adverse revenue balance of £52,709. Is this fair, and especially in view of the prospects of the current year? Coal and oil will be dearer this year; exceptional costs due to the war will be heavier; and the Committee estimate that the reduction of consumption due to street-lighting restrictions will be 290 million cubic feet. There will be the 6d. extra from the consumers; but the disbursements and losses of the year will be of a heavy order. Since 1844, from the profits of the department, there have been paid over to the Improvement Committee, to the Water Committee (for a period), and to the City Fund, with the expenses of street lighting for a period, sums totalling to £3,217,174, which is nearly £200,000 in excess of the total spent on land, buildings, and plant. The more one penetrates into the matter, the more unjust appears the £52,709 which is being carried forward. It may be said that the arrangement for the transfer to the City Fund of £50,000 from the gas-works profits was made prior to the war. But there are no gas profits with which to meet the sum. All the same, the Gas Department has to find the money. Is it at all likely the City Council will take steps to, under the abnormal situation of affairs, do the right thing by practically wiping off the £52,709 deficit by providing for the repayment of the £50,000 in the next City rate? We put the question; but we have not much doubt as to the answer.

## The Gas Woman.

The newspapers are each morning delivered to our dwellings by girls; if we travel to town by a certain suburban line, our tickets are examined or collected by members of the fair sex; during the day "copy" is collected from our office, and proofs are delivered from the printers, by girls; and a girl hands us our evening newspaper as we make the journey home. The biggest piece of domestic news as we sat down to the evening meal a few days ago was that the gas-meter index reader had been replaced by one of the gentler sex, who, carrying an electric-torch, had refused all assistance in penetrating the unknown underground regions of our dwelling, and had successfully discovered the meter in the darkness of the coal-cellar, had read the index, noted its condition on our meter-card, and had gone away without making any more fuss about the job than her masculine predecessor. Dark cellars in dwelling-houses have no terrors for the new index reader, nor, it is understood, has the cobwebby, rodent inhabited cellars of the public houses and factories. Women are not all wanted for nursing purposes for the wounded; and they can do a large part in releasing men, in occupations that can be, at any rate temporarily, carried out by women. As many men as possible are wanted not only for the front, but for the factories—both the old and the ones that have been pressed into service—turning out war munitions; and, in gas undertakings as elsewhere, the rule should apply that, where men or boys can to-day be in any capacity useful to the country directly in connection with the war, and women and girls can with fair efficiency fill their places while they are so engaged, the men and boys should be released, with the same understanding, as in the case of the men who have gone to the front, that their places shall be restored to them as soon as the country has no further need for their special services. Hundreds of thousands of men can have employment on munition work, and overalls ought to be covering many suits that have never known them before. There is a great deal of work that can be done in the gas industry by women while the war lasts—but not after, when the ordinary bread winners are no longer required by the country—not only for meter-reading, but (under proper supervision) in collection work, in the rental departments, and in showrooms, and their introduction into burner maintenance work is not unlikely in certain important concerns. The Gas Light and Coke Company and the South Metropolitan Company have filled up many gaps in the ranks of their employees by engaging women and girls; and the women who are so employed are doing a good part in assisting the nation in the great war by relieving men for the front or for factory forces.

## Why Ilford Climbed Down.

Mr. Councillor Davis is Chairman of the Ilford Electricity Committee; and he put in an appearance at the meeting of the Incorporated Municipal Electrical Association. At that meeting there appears to have been some more or less informal discussion which has not been fully reported in the Electrical Press. A

few lines embedded in a general sketch of the proceedings in the "Electrician" indicates that Mr. Davis was anxious his fellow members of the Municipal Electrical Association should understand correctly why the Ilford Borough Council so completely climbed-down under the actions instituted by the Gas Company as to preferential charges for electricity and their proceedings of the *ultra vires* order in respect of dealings with fittings. Mr. Davis feared that "some engineers may have thought that the Ilford Council had climbed-down somewhat seriously over the recent action by the Gas Company." And so he explained (according to the "Electrician") that "their reason for not proceeding with the fight was simply due to the fact that it would be much cheaper for them to obtain the necessary powers than to fight a case which might have to go to the House of Lords." Mr. Davis would have done better to have held his peace than to have made such an absurd statement. Those who heard it must have been immensely tickled. It is only necessary for electrical men to read the report of the proceedings before Mr. Justice Sargant [see "JOURNAL" for Jan. 26, p. 209], and the statement of claim and order [see "JOURNAL" for May 4, pp. 262-3], to see whether there was any other reason than the one given by Mr. Davis for the full retreat made by the Ilford Council. We think that Counsel for the Borough Council would say that the real reasons for not continuing the fight were of a legal character. If the "reason" advanced by Mr. Davis was the correct one, it is a pity it was not adopted before any expense was incurred by the parties, and which expense the Council, and through them the ratepayers, have had to bear. However, those who heard Mr. Davis's explanation no doubt realized fully that he was making the best possible of a bad job, and so took the "reason" for what it was worth, and with all the good nature they could command.

### The Spotless Consultants.

The "Electrician" not long since descended to the vulgarity of calling the writer of "Electricity Supply Memoranda" a "liar." The expression had to be withdrawn; otherwise an opportunity would have been given to our contemporary to attempt to justify it. The paper that was guilty of this departure from the proprieties in journalism has constituted itself judge of our recent remarks on the Association of Consulting Engineers [*ante*, p. 630]. These remarks are described by it as "an attack in very questionable taste." What, in the circumstances, it calls the recent attack on a member of our staff dare hardly be contemplated. We must, however, decline to accept the "Electrician" as possessing unalloyed qualifications for judgment as to what is in good or bad taste. We are now asked by our contemporary to "remember that for some years there has been an outcry against methods followed by certain consultants." The only reply that need be made to this invitation to remember something is that possibly our outlook is not quite the same as that of the "Electrician." There has been no "outcry" so far as the consultants of the gas industry are concerned; and they do not appear to require rules and regulations to maintain a respectable standard of professional conduct, nor to bind themselves together for mutual support, and for pledging themselves to act in a certain way. We do not notice an extraordinarily large number of electrical engineers in the ranks of the Association, which, our contemporary says, "at least provides a body of men with which the public can deal, and be sure that certain principles will be followed." Then it comes to this, that membership of the Association gives the hall-mark of a spotless rectitude; and that this band of men forming a small minority of the engineering consultants can be relied upon for honesty, while those outside must be held as suspect and not bound by any tie or law to follow "certain principles." The "Electrician" adds: "It is, of course, easy to make innuendos, like those in which our contemporary indulges, but they serve no useful purpose." Applying the words to the "Electrician," we agree.

### The "United" Promoting Machine.

Comment was made the other week (*ante*, p. 630) upon the fact that the United Gas-Works Development Company, Limited, were inviting those with "idle" capital to apply for 35 shares in the Wilts "County" Gaslight and Coke Company. It was not stated how many parcels of 35 shares the Company desired to sell, or whether there was only the one parcel, which the unfortunate holder, under pressing circumstances, was forced to sell, though no doubt greatly disinclined to do so. On March 30 last (p. 816), we dealt with a circular-letter which had been sent out by William Judd, the United Company's Secretary, offering for sale £10 debentures and some ordinary shares in the United Development Company, the balance-sheet of which was then reproduced for the delectation of our readers. Recently Hughes, Gordon, and Co., of 83, Pall Mall, have been sending round a circular-letter, offering 25 £10 fully-paid debentures in the United Development Company, carrying interest at the rate of £10 per annum. "The holder," the letter states, "is compelled to realize for immediate cash, owing to financial difficulties, caused by the war;" and the firm are authorized to accept £9 10s. per debenture or £235 for the whole lot. When William Judd was hawking round debentures, he was asking £10 each for them. We are sorry there should be so many unfortunates with shares to sell in the United Company and its progeny. It was under "exceptional circumstances" that the holder of the United Company's debentures and shares had to sell when William Judd was at work. When he had the Wilts shares for disposal, the "present owner" was compelled to part "at a sacrifice;" and now the holder of the United debentures is in "financial difficulties caused by the war." Who constitute the firm of Messrs. Hughes, Gordon, and Co. who have had these debentures "placed in their hands for disposal?" If readers will turn again to the "JOURNAL" for the 15th inst. (p. 630), they will see some reference to the Mutual Industrial Corporation being in the Bankruptcy Court. The primary object of this Company was the acquisition of a company-promoting business carried on by H. H. D'Aeth and J. Gordon, under the style of Hughes, Gordon, and Co.; and D'Aeth and Gordon, it was then remarked on the authority of the official statement from the Bankruptcy Court, were the principal shareholders in the United Gas-Works Development Company! The war loan, with Government security, is better than United Gas-Works Development Company's debentures; and securities in well-established gas companies come next.

## THE TEGEL (BERLIN) GAS-WORKS FIRE.

### NO INTERRUPTION IN THE SUPPLY OF GAS.

**[Translation of an Article in the "Berliner Tageblatt" of June 20.]**

THE great fire on the municipal gas-works at Tegel* has not caused any inconvenience or interruption of any kind in the supply of gas. It broke out in the one-storeyed wooden building, measuring 30 m. by 50 m., in which are situated the underground tanks for ammonia and tar. The tanks are very securely roofed in, in order to avoid any escape of vapours. The inner space of the wooden building serving as cover for the tanks, was completely empty. The roof was covered with tar paper.

From some cause not yet ascertained, the fire broke out at a corner of this isolated wooden building, and spread quickly. In a very short time, the entire building was a mass of flames. Besides the fire brigade of the works, those of Tegel, Reinickendorf, Wilhelmsruh, and of the Borsig works, and also one from the town of Berlin itself, assisted in the extinction of the flames. Sixteen lengths of hose were laid from the water-tower of the gas-works, and attacked the flames from all sides. Fortunately, the wind was favourable, as otherwise the neighbouring purifier-house would have been endangered. Of the wooden building nothing could be saved; it was entirely burnt. What remained was so completely carbonized that it had to be pulled down. In about one-hour-and-a-half the outside fire brigades were able to leave the work of extinction to the works fire brigade.

The tanks under the destroyed building were entirely unaffected. Russian prisoners, who for some time have been employed on the gas-works, were immediately called to clear away the *débris*. No interruption of any sort was caused by the fire.

* A telegram on the subject, through the Central News Agency, was quoted on p. 694 of last week's issue.—ED. J.G.L.

The Metropolitan Water Board last Friday authorized their Chief Engineer to give his personal services to the Metropolitan Munitions Committee, of which he has been appointed Vice-Chairman, and Chairman of the Management Board. The Board also decided to grant the use of their staff, workshops, and tools for the manufacture of munitions, to be purchased by the War Office at cost price, *plus* 10 per cent.

The Council of the Royal Society of Arts have arranged with Professor Vivian B. Lewes to deliver a short course of special lectures during the recess on "Modern Munitions of War." Three lectures will be given, at 4.30 p.m. on Wednesday afternoons, July 7, 14, and 21. The first lecture will deal with "Guns and Propellants," the second with "Mines, Shells, and High Explosives," and the third with "Poison Gases and Incendiary Bombs." The course will be under the Fothergill Trust.

## PERSONAL.

At the last quarterly communication of the United Grand Lodge of England, W. Bro. W. D. CHILD, of Romford, P.M. No. 1237, was appointed one of the Committee of Management of the Royal Masonic Benevolent Institution.

It is gratifying to note that Lieutenant EDWARD SCOTT-SNELL, of the Army Service Corps (who is well known to "JOURNAL" readers), is mentioned in dispatches among those whom Sir John French wishes to recommend for "gallant and distinguished service in the field."

On the occasion of the marriage of Mr. F. W. COOPER (Assistant Superintendent of the City of Leeds Gas Mains and Distribution Department), the employees last Friday presented him with a case of cutlery suitably inscribed, as a token of esteem, appreciation, and goodwill. The presentation was made by Mr. Walter Hole (Superintendent) on behalf of the men; and the recipient acknowledged the gift in a suitable manner.

Mr. S. W. DURKIN, the Distributing Engineer of the Australian Gaslight Company, Sydney, has been appointed Engineer of the South Australian Gas Company, Adelaide, consequent upon the retirement, through ill-health, of the present Engineer, Mr. W. Ray. Mr. Durkin (who has been in Sydney for about fifteen years, and has proved himself a very capable officer) is the son of the late Mr. Durkin, of Southampton. He enters upon his new duties in July.

At their meeting last Thursday, the Stoke-on-Trent Federated Council confirmed a recommendation of the Gas Committee that Mr. LEONARD J. LANGFORD be appointed Chief Engineer and Manager of the four Potteries gas-works, at a salary of £500 per annum, rising to £700. Mr. Langford is a son of Mr. W. Langford, the late Chief Engineer and Manager of the Potteries works, who died a short time ago. He was born and educated at Bath, and received his technical training in gas engineering at the gas-works there, under Mr. C. Stafford Ellery. In 1902, he was appointed Assistant to his father, who was then Manager of the Longton Corporation Gas-Works, and was actively associated with him in effecting extensions and improving the general results. Six years later—in 1908—Mr. Leonard Langford was (out of over seventy applicants) appointed Manager of the gas-works of the Abertillery Urban District Council. Since that time the output of gas has doubled, and the price has been reduced 6d. and 7d. per 1000 cubic feet to ordinary and slot consumers respectively. The works have also been entirely remodelled and extended; the last addition being the installation last summer of two sets of Messrs. Humphreys and Glasgow's water-gas plant. For the past two years, the rates have benefited by annual contributions of £1000 from the undertaking.

## OBITUARY.

Mr. JOHN GRIFFIN, who died recently at the age of 87, was the Chairman of the Kineton Gas Company.

We regret to learn that Mr. HUMPHREY HULME, R.N.V.R., for the past few years Assistant under Mr. G. M. Gill at the Wapping works of the Commercial Gas Company, and the youngest brother of Mr. Charles Hulme, Manager to the Uxbridge Gas Company, has been killed in action in the Dardanelles. Deceased, who was only 23 years of age, enlisted as an ordinary seaman in the Royal Naval Division (Nelson Battalion) soon after the outbreak of war, and had been in the Dardanelles for some months at the time of his death. He was very popular with the men and staff alike, and would undoubtedly have made a name for himself, as he was a conscientious and hard worker, and in all he did he showed that he had real ability, while his personal qualities made him a very pleasant man to work with. He was articled to Messrs. H. E. & F. H. Jones, of Palace Chambers, S.W.

**High Explosives Organizer for Wales.**—It is announced that Mr. J. H. Canning, the Manager of the Newport (Mon.) Gas Company, has been appointed by the High Explosives Committee to organize and direct the work of providing high explosive material in Wales and Monmouthshire. He will be assisted by a Committee of five gas engineers selected from the Wales and Monmouthshire Institution of Gas Engineers and Managers.

**Removal of Rust from Iron.**—At the annual meeting of the Iron and Steel Institute, Dr. J. Newton Friend and Mr. C. W. Marshall described some experiments on the removal of rust by means of chemical reagents. They pointed out that for many purposes of both technical and purely scientific importance it is desirable to find some method of removing rust from iron. They have themselves found scraping with knives and polishing with sand or emery paper perfectly satisfactory for small specimens; but for large pieces such a process is very disagreeable and fatiguing. As dilute solutions of sodium citrate are often referred to as being suitable for loosening rust without dissolving any iron, they tried experiments with it, and also with other reagents, such as boric acid, aluminium sulphate, chromic acid, zinc sulphate, magnesium chloride, and ferrous sulphate, but failed to find any one that would remove the rust quantitatively without also dissolving some of the iron.

## THE PRICE OF COAL AND FREIGHTS.

### Conference of Members of Parliament.

A CONSIDERABLE number of Members of Parliament met in conference for the third time on Tuesday last, to consider the recommendations made by the following Committee appointed by them on the 15th inst.

*Chairman:* Lord Claud Hamilton, M.P.

1. *Colliery Proprietors:*
Sir Arthur B. Markham, Bart., M.P.
Sir Alexander Henderson, Bart., M.P.
Hon. H. D. M'Laren, M.P.

2. *Shipowners:*
Sir Walter Runciman, Bart., M.P.
Mr. R. D. Holt, M.P.
Mr. R. P. Houston, M.P.

3. *Workmen:*
Right Hon. Charles Fenwick, M.P.
Mr. T. Richardson, M.P.
Mr. B. Kenyon, M.P.

4. *Consumers of Coal:*
Mr. W. Joynson-Hicks, M.P.
Sir Daniel Ford Goddard, M.P.
Sir Corbet Woodall.

The Committee made two recommendations, which, after discussion, were slightly amended, and resolutions were passed in the following form:—

(1) That during the continuance of the war the maximum price of coal, for home consumption and for our Allies, at the pit-head, be fixed on the basis of the prices charged at the pit-head for substantial quantities of each class of coal sold during the twelve months preceding the war, with an addition of 4s. 3d. per ton, or such other sum as may be prescribed, to cover the increased costs owing to the existence of the war.

Resolution No. 1 was carried by the conference with only four dissentients.

(2) That the rate of freight for coasting steamers employed in the coal trade be fixed on the basis of the rate charged for freight during the twelve months preceding the war, with the addition of such a sum as will reasonably cover the increased cost owing to the existence of the war; and that the Government be urged to assign a further number of the interned steamers for the use of the coal trade.

Resolution No. 2 was carried unanimously.

The conference had begun to disperse when it was proposed to pass the further resolution as follows:—

(3) That the Government be requested to regulate the price of coal asked by the merchant of the consumer.

There was a smaller number of members present when this resolution was put to the conference. Many also refrained from voting—twenty members being in favour of the same and twelve against.

R. J. N. NEVILLE, Hon. Secretary.

## NATIONAL ROAD EXHIBITION.

IN connection with the National Road Conference now taking place under the auspices of the County Councils' Association, a useful exhibition has been arranged of road materials, machinery, &c. The conference is being held in the lecture room at the Royal Horticultural Hall, Westminster, S.W., and the exhibition is in two parts. In the main body of the hall itself, there are exhibits which consist mainly of road materials; while machinery and appliances of various kinds are housed in a building near by. Papers are being read on the first four days of this week; and during this time the exhibition will remain open. It may be pointed out that the fixture is the outcome of steps which were taken well before the outbreak of war. Subsequent events caused the Association to hesitate as to whether or not they should abandon the enterprise; but they state that they were so assured of a widespread desire for the conference and exhibition, on the part both of local authorities and of prospective exhibitors, that they decided to proceed. Acknowledgment is made of the valuable support rendered in the work of organization by members of the Road Board, the Institution of Municipal and County Engineers, and the County Surveyors' Society. As evidence of the need of some such exhibition at the present time, it is remarked that the road problems in this and neighbouring countries are not less, but more, pressing than they were two years ago, as "the heavy extra traffic due to military transport in this country, and the total destruction of the roads in many parts of Belgium and Northern France, raise problems different altogether in degree, and to some extent even in kind, from those which have been previously considered."

Of course, road-making materials and road-making machinery and appliances occupy the larger portion of the exhibition; but there are also a number of other items. In the first-named class, the Gas Light and Coke Company have a stand, on which are

to be seen pitch, dehydrated tar specially prepared to the Road Board specification, thinning oils, creosote oils for preserving timber, tar-coated granite, disinfectants, and "Pitchphalte." This last is a grouting and surfacing material for roads, which the Company claim is as efficacious as bitumen, at considerably less cost. It is said to perfectly withstand sun-light and frost, and can be readily applied; while its great binding power holds road metal firmly in position—thus preventing internal attrition under the action of traffic. Another advantage which this material possesses is that it can be supplied in bulk, and thinned with oil *in situ*, so saving all cost of packing. The South Metropolitan Gas Company also had intended having a display; but at the last moment they were regretfully compelled to make the announcement that, in consequence of their plant being utilized for work in connection with the war, they were unable to exhibit.

The Birtley Iron Company have a display of their pipes, and various specialities; and Messrs. A. C. Wells and Co. show their lights, lime-washing machines, and other goods. The Metal Jointing Company draw attention to the "Amalgaline" process of jointing lead; and there are several stands where reinforced concrete work is to be seen.

## LIQUID PURIFICATION OF GAS.

In our "Register of Patents" during 1913, as well as in a paper which he read before the Institution of Gas Engineers in the same year, and subsequently in the "William Young Lecture" he delivered before the North British Association, reference was made by Dr. W. B. Davidson, of Birmingham, to the system of liquid purification using graduated temperatures and pressures invented by him. The following brief allusion to the method is contained in an article on the "Purification of Coal Gas" appearing in the current issue of the "Times Engineering Supplement."

The process of separating the acid gases from the ammonia is carried on in a vertical still of the usual pattern, to the top of which the liquor is fed. The still is heated by steam introduced at the base, and while the ammonia is taken off at a point half-way up the column, the sulphuretted hydrogen and carbonic acid are expelled from the top. This separation of the ammonia and acid gases is made possible by graduating the temperature and pressure within the still; the pressure being so regulated that a comparatively high pressure is obtained in that portion of the still from which the ammonia is collected. After leaving the still, the gaseous ammonia is passed through absorbers to remove any traces of the acid gases, and is then remixed with the crude coal gas at any convenient point, such as at the condensers or washers. From the washers, scrubbers, and condensers the ammoniacal liquor is collected and returned to the still, while the surplus ammonia—being recovered in an extremely pure form—provides a valuable bye-product. The working pressures in the still amount as a minimum to approximately 5 lbs. per square inch at the point where the steam is applied, 4 lbs. per square inch where the ammonia is withdrawn, and 3 lbs. per square inch at the zone where the acid gases are removed. Higher pressures than these (worked in the same ratio) will, however, give more satisfactory results.

Though it is not essential to the process, Dr. Davidson prefers to treat the gas which has passed the ordinary washers and scrubbers with a sludge of ferrous hydrate, prepared from chloride or sulphate of iron and ammoniacal liquor. In this way, the whole of the sulphuretted hydrogen may be removed. In addition, hydrocyanic acid—a product which in the light of recent investigation has been shown to be undesirable—is eliminated by the iron sludge after it has been used for extracting the sulphuretted hydrogen. The whole process is one which the gas engineer will be well advised to keep in view.

### Nottingham Royal Show.

The stand of Messrs. Crossley Bros., Limited, of Openshaw, Manchester, proves to be one of the attractions of the Engineering Section at this week's Royal Show at Nottingham; and those interested in any form of power production may look forward to seeing there the latest developments and improvements in gas and oil engines and gas plants. This year Messrs. Crossley Bros. are amply representing their manufactures of gas engines and suction gas plants, and refined and crude oil engines, in both large and small size units. The firm's exhibit will comprise engines of from 72 maximum B.H.P. down to 3¼ maximum B.H.P. In addition, there will be shown a suction gas plant of the Crossley open hearth type, which will provide the gas for running two of the engines. The town gas engine (of 12¾ maximum B.H.P.) will be of practically the same design as the large unit, so far as massive construction and general appearance are concerned. Continuous lubrication is employed, and throttle governor gear is fitted—which is claimed to be a great improvement on the hit-and-miss method hitherto adopted for small-type engines.

The late Mr. Thomas H. Harvey—a well-known tar distiller and chemical manufacturer, of Fareham (Hants), having offices at Stamshaw, Portsmouth, and Cattedown, Plymouth—left estate of the gross value of £104,348.

## ELECTRICITY SUPPLY MEMORANDA.

Those selfish and fanatical persons known as the Point-Fives prosecute their doctrines without any consideration for their fellows who have not, for no doubt very good reasons, adopted their methods. There are only 22 in the band out of all the electric undertakings in the United Kingdom; and they cherish the belief that they are wiser than the managers of all the other concerns, most of whom work solely on flat-rates or the maximum demand system. If the nostrum for all the trading ills from which electrical concerns suffer is that proposed by the Point-Fives, well then it is very strange that the administrators of the other hundreds of undertakings have been so dense as not to have been able to see it. At the meeting of the Incorporated Municipal Electrical Association the other day, two of the adherents to the principal system of the Point-Fives (which, of course, means a charge with them of more like three times 0·5d. per unit, including the fixed payment) presented a report which, with the discussion, is likely to do more injury to their cause than to promote it. The managers of gas undertakings, at any rate, will be much obliged to the reporters—Messrs. A. S. Blackman, of Sunderland, and T. Roles, of Bradford, for what they have confessed. In no town is the Point-Five system compulsory for domestic consumers; it is only optional. Its chief form, as readers of the "Memoranda" are aware, is a fixed charge ranging from (in different towns) 10 to 15 per cent. on the rateable value of the houses, and a secondary charge of 0·5d. per unit consumed, no matter the purpose. In the case of Poplar, the fixed charge is based on the number of kilowatts installed; and this is a more accurate basis than rateable value, which is described in the report as "a means which is ready to hand of determining the fixed charge approximately, in accordance with the electricity consuming capacity of the premises." This it does not do, seeing that there is such a wide divergence between the electrical consumption of houses of like rateable value, and even of high and low rateable values. There are some many-roomed houses in a district of which we know—houses suitable for extensive membered families—for which the landlords are glad to get rents not more than are obtained for modern houses of half the size in the same neighbourhood. The rateable value of the former is low compared with that of the latter; and the electrical consuming capacity of the former is a big thing compared with that of the latter. Why are the big low-rented houses given preferential treatment over the smaller houses in the average price paid for current? The basis of rateable value, too, as we have pointed out before, has no connection whatever with the provision and supply of current; and it is a basis that is being depreciated in some areas, and so must, as time passes, reduce the fixed charge for current. Luton and Southampton have flat-rates of 0·5d. for cooking and heating; but Sir John Snell, it will be remembered, has advised the Southampton Corporation to abandon the flat 0·5d. rate, and to adopt the rateable value *plus* ¼d. per unit system.

**The Point-Five System.**

**"Advantages," General and in Lighting.**

The system of a primary fixed charge and the secondary charge of 0·5d. per unit is put forward as possessing certain advantages in curing defects in trading on the flat-rate system; and this is where the administrators of the concerns that have not adopted the rateable value system will not be at all pleased, while the managers of gas undertakings will find in the case put forward confirmation of prior knowledge and beliefs, on which certain trading contentions have been based by them. In other words, Messrs. Blackman and Roles say as plainly as they dare do that gas managers in their assertions regarding the uneconomic character of electricity for domestic purposes have not been guilty of fabrication, but that those who denied the truth of what the gas managers said were the fabricators. To put it another way, the reporters assert that, until the rateable value system came along, with the 0·5d. unit supplementary charge, electricity had not, from all economic standpoints, the same beneficial showing as gas. In the first place, Messrs. Blackman and Roles claim that the fixed-price-*cum*-secondary-charge system enables electricity canvassers to estimate fairly well what the account of a prospective consumer is likely to be; it also lessens any important error in metering; and only one meter is required with the charge per unit at ¼d. for all purposes. It is also stated that there is an inducement under the system to equipping more rooms with electric light, as, owing to the cost, it was frequently found under the flat-rate system that only the "best" rooms were electrically lighted, and the remainder were still illuminated by gas. In fact, the reporters declare that, under the flat-rate system (everything wrong is laid to the charge of the flat-rate system), the lighting of most houses compared unfavourably with a house illuminated by gas, especially where mantles in the latter were kept in good condition. This admission has been hard to obtain from the electricians. When in times past any similar assertion has been made by gas people, it has been ridiculed by their competitors; but now we have good authority for it. Messrs. Blackman and Roles also admit that complaints were made as to the inefficiency of electric lighting as compared with gas. If these complaints existed before, they must exist now where electricity is charged for on one of the older systems. The rateable

value system of fixed charge, with the supplementary 0·5d. per unit it is claimed, alters the conditions. Householders are no longer bound, it is said, to use small unit lamps, but larger ones are now employed, through the supplementary charge of ½d. per unit making little difference. Thus insufficient illumination is overcome by using higher power lamps.

**And in Heating.**

Then in respect of domestic heating by electricity, Messrs. Blackman and Roles show with what truth gas men had measured the demerits of the electric-radiator as a heating agent. It is now confessed that, with the 1 K.W. four-lamp radiators, using current at 1d. per unit, much dissatisfaction was expressed at the small amount of heat given off, and at the expense attaching to their use. This admission as to heating inefficiency is highly interesting to us, because we have been cruelly abused for saying precisely the same thing. Then up comes the cure-for-all-evil in electrical trading—the system of a fixed charge and ½d. per unit consumed. With this system of payment, and consumers not being able to tolerate the heating pretender in the shape of the 1 K.W. radiator, they now put in electric-heaters using 3 or 4 K.W. per hour—in fact, in several towns, the 3 K.W. radiator has now become the standard. It has been a common thing for people to say that it is necessary to sit on the four-lamp radiator in order to keep one's self warm. Messrs. Blackman and Roles do not exactly say that. But they do remark: "The result [of this change to the three or four kilowatt radiator] is that, instead of electric-radiators being used to warm the occupants of rooms by radiant heat, the air temperature of the rooms being but little affected, the temperature of the apartments is kept practically constant throughout, and the occupants are under no necessity to remain within the direct rays of the heaters." This is about as damaging a statement as could be levelled against the electric-radiator. It shows that the 1 K.W. radiator can only warm a person one side at a time; and that he must sit directly in the path of the radiant emissions to get this service performed. It also shows that for ordinary rooms much more energy than 1 unit per hour must be used. Then as to the cost of the 3 or 4 K W. radiator—say, the 3 K.W. one—the supplementary charge being ½d. per unit, this does not mean that the radiator can be used (full on) for 1½d. per hour. On the contrary, with the fixed price *plus* the ½d., the average charge per unit may work out to (say) 1·75d. per unit, so that the 3 K.W. heater would cost, at this average price, 5·25d. per hour (full on). This is the price to pay for being allowed to keep warm without having to sit in the "direct rays of the heaters."

**Curious Revelations.**

Messrs. Blackman and Roles took their respective towns of Sunderland and Bradford as examples of the "advantages" of the Point-Five system; and the advantages were not exactly striking. For any expansion of business there may have been, all credit must not be given to the Point-Five system; there are, of course, other causes. But from the suppliers' point of view, see what has happened in the two cases. Take Bradford first. There 15 per cent. is charged on the rateable value, *plus* ½d. per unit. The hypothesis that these charges will bring in for lighting only an amount equal to what would be produced by the lighting at 4d. per unit, and that therefore other domestic purposes will be supplied at ½d. per unit, is discredited by the illustration. How has it worked out in practice in Bradford? The average consumption per house under the old tariff was 680 units; and under the new, 1325 units. Notwithstanding that the units consumed under the new tariff were about twice as many, the average revenue per house was only £9 16s. 10d., as compared with £11 5s. 6d. under the superseded tariff. It does not appear to be a very good business transaction to lose £1 8s. 8d. of revenue per house, and to supply 645 units more for the lower revenue. There must be something fundamentally wrong about a system which produces this state of things. What is more, a further 688 units would have to be supplied to iron-out the £1 8s. 8d. deficiency—that is to say, 1333 units more than under the old order of things must be supplied to counterbalance the average revenue per house. The average price realized under the old tariff was 3·98d.; and under the new (including the fixed charge), 1·78d. In the case of Sunderland, the revelation is almost as bad as to the extra supply, and yet a lower average revenue, per house. There, under the old system, the average consumption per house was 512 units, yielding a revenue of £7 14s. 5d.; the average price being 3·6d. per unit. Under the new tariff the average consumption is 1073 units, the average revenue per house £7 1s. 7d., and the average payment per unit 1·58d. Here the units supplied increased by 561, while the average revenue was 12s. 10d. less, per house; so that an additional 308 units at ½d. would have to be supplied to realize the old revenue. In other words, the station would have to supply 869 units more than under the old tariff, in order to obtain a corresponding revenue. And this is looked upon as good business! Notwithstanding these figures, it is not all new consumers who care for the rateable value system of charging. Of the total sales of current at Bradford only 3 per cent. is to private houses; and at Sunderland 2·6 per cent. The total number of private houses connected in Bradford on Dec. 31 last was 1298; and at July 1, 1910, the number was 511, so that there has been an increase of 787. Of these, 403 have elected to be charged on the rateable value system; while 384 have chosen otherwise. Of the 511 previously connected, 383 have adopted the new tariff in place of the 4d. flat rate. To the 337 private houses connected in Sunderland prior to the adoption of the new tariff, 162 have since been added. Of these additions, 100 elected to come under the new tariff, and 62 preferred the flat-rate of 3·6d. per unit. Of the pre-existing 337 private consumers, 105 have changed-over to the new tariff. The facts as to the considerable increase in consumption per house, while the revenue had diminished, struck several speakers in the discussion, with the general adverse tone of which Messrs. Blackman and Roles were very disappointed.

**Hiring Rates for Heaters and Cookers.**

There is one other point worth notice. That is as to the heavy rates that have to be charged for hiring electric heaters and cookers, where hiring powers are in force. This is the best possible testimony to high initial and maintenance costs. Of the twenty-two so-called "Point-Five" electricity undertakings, hiring powers are possessed by Carlisle, Marylebone, Southampton, West Ham, Wolverhampton, and York. At Carlisle, for the rental of electric cooking and heating apparatus, 20 per cent. on the capital cost per annum is charged; at Marylebone, the rate for cooking apparatus is 30 to 35 per cent., and for heating apparatus 50 per cent.; at Southampton, 25 per cent. on both; at West Ham, 20 per cent. on both; at Wolverhampton, 15 per cent. on both; and at York, 10 per cent. on cooking apparatus, and 25 per cent. on heating apparatus.

**Town Gas Driven Generating Plant.**

A summary of an address delivered by Mr. A. H. Dykes a short time ago to the Association of Supervising Electricians has been resting among our notes for reference. He was speaking about the generation of electricity by private plants; and he admitted that, where town gas is available, a gas-engine with belt-driven dynamo makes a good combination. He took the average consumption of gas as 35 cubic feet per unit of electricity generated; and so with gas at (say) 3s. 6d. per 1000 cubic feet, he put the cost of fuel per unit generated at 1·46d. We wonder why Mr. Dykes went into the provinces to a comparatively small undertaking with obviously a small power load to find such a price as 3s. 6d. for gas for power purposes. Millions and millions of cubic feet of gas for power are supplied daily at (say) 1s. 6d. per 1000 cubic feet (in some cases at below this figure). At 1s. 6d., 35 cubic feet would work out to only 0·64d. per unit. Mr. Dykes was not fair to town gas. Nor is it fair to put into contrast the cost of fuel only for a suction-gas plant with the cost of purified town gas sent straight from the supply-pipes into the cylinders of a gas-engine. The cost of anthracite or coke is not the total figure to bring into comparison with town gas. It may interest Mr. Dykes to read an article published last August in our columns relating to electricity supply to a Plymouth Cinema by a private gas-driven generating plant. There he will see that, with a duplicate plant, the electricity generating costs, including every charge, amounted to only 1·18d. per unit for all purposes, with an independence from the vagaries of external supply. In an article that appeared in last week's issue, on the use of gas for driving laundry machinery (this being a case where there was failure of an electric-motor), it was shown that a dynamo, belt-driven from the main shafting, produced current for lighting at an estimated cost of ½d. per unit. Then there was the scheme the South Metropolitan Gas Company put before the Lewisham Guardians [see the paragraph headed "Ingratitude" in the "Memoranda" for April 6 last, p. 19] for a private gas-driven electricity generating plant, by which energy was guaranteed for lighting at 2d. per unit and for power at 1½d. including *all costs*—capital and everything else. The South Metropolitan Company did not make their offer without considerable experience in South London as to what they are able to perform in this way. Electricity was generated by large gas-engines on town gas by the South Suburban Gas Company for the exhibition at the Crystal Palace a few years ago; and the contract was at a price with which the local electricity suppliers could not compete for lighting. An article in our issue for May 18 described how Wood Green is being supplied from a town gas driven electricity station by the Tottenham Light, Heat, and Power Company, who made out a better case, and gave better terms to the district, than the North Metropolitan Electric Power Supply Company were able to do. Mr. Dykes did not, in his reference to town gas driven generating plants, put forward the best possible case for them, though he was not by any means unkind, as he did show the Supervising Electricians (if they knew anything of costs for power gas in their areas) that he had taken an abnormally high figure. There is a large experience of town gas driven generating plants—in gas-works, and on gas-supply districts, which tells a different tale from Mr. Dykes's 1·46d. for fuel only per unit.

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At a recent meeting of the Faraday Society, Messrs. K. C. Browning and C. T. Symons described a convenient thermostat for making accurate specific gravity determinations as well as a gas-pressure regulator. Having had occasion to make a number of accurate specific gravity determinations, the authors devised a thermostat the temperature of which can be kept constant to considerably less than 0·01° C. The advantages of this regulator are: (1) It does not leak either at the valve or at the flexible top. If a gas pressure of 30 inches of water be applied at the inlet, a water-gauge at the outlet will not alter its level perceptibly when the pressure at the inlet is maintained for half-an-hour. (2) It is portable and takes up little room. (3) It can be rapidly set for any desired reduction of pressure. (4) It does not require careful levelling, and is very strong.

# ALKALI WORKS CHIEF INSPECTOR'S REPORT.

The Annual Report of Mr. W. S. Curphey, the Chief Inspector under the Alkali Works Regulation Act, 1906 (the fifty-first of the series), which has just been issued, deals with the year 1914; and it includes the reports of the various District Inspectors, and that presented to the Secretary for Scotland.

### Registrations and Inspections.

By way of introduction, Mr. Curphey remarks that the number of works registered in England, Ireland, and Wales was 1356, in 68 of which salt was decomposed with evolution of muriatic acid, defined in the Act as "alkali works." In the remainder, operations were carried on which called for registration under section 8, or as one or more of the works enumerated in the first schedule of the Act. There was thus, compared with 1913, a decrease of two in the number registered as alkali works, and an increase of 31 in the number otherwise registered—the net increase being 29. There were also 170 works in Scotland registered under the Act, making in all an aggregate of 1526 for the United Kingdom. The number of visits to works last year was 5893, and of tests made 5483. In addition to these, numerous visits and inquiries were made in connection with works which were found not to come within the scope of the Act, in connection with complaints received regarding alleged annoyance or injury from noxious gases escaping from registered works, and in connection with the disposal of acid or other drainage provided for under section 3. The number of separate processes of manufacture under inspection last year was 2044, compared with 1997 and 1943 in the two preceding years. These figures show an increase of 47 processes under inspection as compared with 1913, and of 101 compared with 1912. They are the result of various changes. Some processes formerly under inspection were discontinued, while others came under inspection for the first time. This increase, as has been the case in recent past years, is associated largely with the manufacture of sulphate of ammonia and with the distillation of tar. The number of sulphate and muriate of ammonia works was increased by 29, and of tar-works by 13.

### Escaping Acid Gases.

The average escapes of acid gases from the various exits for waste gases recorded for the several districts show many noticeable fluctuations. The general averages vary but slightly as compared with the corresponding figures for the previous year, but the more general tendency is towards a smaller proportion of acid in the gases discharged into the air. Much attention was given, as usual, to the general condition and operating of the plant in use as affecting the conditions existing inside the works and in the immediate neighbourhood. Further improvement occurred during 1914 from the extended adoption of mechanical appliances in place of manual labour in certain of the operations which are liable to cause local escape of acid gases or fumes. This was especially the case as regards bleaching powder manufacture, superphosphate manufacture, and extraction of copper by the wet process. The mechanical devices put into operation in these cases improve very greatly the environment of the men employed, and remove cause for complaint in the vicinity from local escapes of acid gases, while they are more reliable for uniformity of working. Though the men employed are the first to feel the effects of local escapes of acid gases, it is difficult in many cases to ensure that the simple but additional precautions required to minimize such escapes will be carried out. During the latter part of the year this was more marked than usual. Many of the best skilled process men left their ordinary work for military service, and no equally skilled substitutes were available. The general demand for labour in many districts was strong; and managers of works had to carry on their operations with such labour as was available, while at the same time the products of manufacture were urgently required. This position has caused much anxiety, and called for additional attention on the part of both manager and inspector.

### Contraventions of Regulations.

During the year, no proceedings were entered into to recover penalties for contravening the provisions of the Act, through undue escape of noxious or offensive gases, or for failure to use the best practicable means for the prevention of their escape. In two cases, however—one occurring in a sulphuric acid works, and another in a tar-works—compliance with the requirements of the Act was not satisfactory. This unsatisfactory condition in both cases culminated at the time when war was declared; and under the exceptional circumstances consideration of action was delayed for a time, a severe warning from the Board being meanwhile given to the owners of each works. Subsequently, no further occasion arose calling for reconsideration as to the necessity for instituting penal proceedings. In three cases registrable processes were discovered to be in operation in works which were not registered, and which, therefore, were being carried on in contravention of the Act. After full consideration, back fees in varying amounts, according to the circumstances of each case, were accepted in lieu of taking proceedings to enforce the penalties that had been incurred.

### Sulphate of Ammonia.

Dealing with sulphate and muriate of ammonia and gas liquor works, Mr. Curphey says that a still further increase in the number of this important class of works has to be reported. During the year, the number of processes under inspection was 680, an increase of 31 over 1913. This increase is of varied character, and was due to new registrations in gas-works, coke-oven works, and producer-gas works. Through the courtesy of manufacturers, he is again enabled to present figures showing the quantity of ammonia (expressed in terms of sulphate) recovered in the United Kingdom as a bye-product in the various industries given in the following table:—

| — | 1914. | 1913. | 1912. |
|---|---|---|---|
| | Tons. | Tons. | Tons. |
| Gas-works | 175,930 | 182,180 | 172,094 |
| Iron-works | 16,008 | 19,956 | 17,026 |
| Shale-works | 62,749 | 63,061 | 62,207 |
| Coke-oven works | 137,430 | 133,816 | 104,932 |
| Producer-gas and carbonizing works (bone and coal) | 34,295 | 33,605 | 32,049 |
| Total | 426,412 | 432,618 | 388,308 |

The disturbing influence of the war, Mr. Curphey remarks, has affected most of these different groups of works; the only exception being the shale-works, which have remained very steady under the new conditions as regards the production of sulphate. The reduction in the case of the iron-works is very marked, amounting to nearly 20 per cent. on the production in 1913; while the much smaller relative loss in production (3·4 per cent.) from gas-works liquor is an indication of the reduced output of gas largely due to the restrictions in the out-of-doors illumination in urban areas. The reduction from gas-works liquor must be regarded as really more serious than is represented by the net figure—the actual 3·4 per cent. observed—as there were cases where sulphate of ammonia was recovered for the first time from gas-works liquor not previously utilized; while the annual increase of production characteristic of the gas industry during recent years would probably have continued under normal conditions. Coke-oven works and producer gas, &c., works both show an increased production over 1913; but it is most probable that this increase would have been more marked had difficulties associated with the war not led to delay in the completion and operation of further recovery plant under construction.

### The "Direct" Processes and Ammonia Saving.

The "direct" methods for manufacturing sulphate of ammonia continued to give satisfaction both in coke-oven works and in those gas-works where the newer style of working has been introduced. In gas-works there was considerable extension. New plants of very great variation in scale of operations were put into working or were in course of construction at the end of the year. In the fiftieth annual report reference was made to the claims of high production in gas-works, by using the "direct" process, of sulphate per ton of coal carbonized; but Mr. Curphey is not yet in a position to give figures on a sufficiently wide basis for comparison of the newer and older methods. It is to be anticipated, however, he says, that the "direct" process should give higher yields per ton as compared with the older. How much higher will depend to a large extent on the losses previously incurred by imperfect scrubbing of the coal gas and in the handling and storage of the liquor. In this latter respect, there are very wide variations in the practice followed in different works. In some cases so much care is taken to reduce to a minimum those losses which cannot be entirely avoided, that little margin is left for gain by the adoption of the method of direct production of sulphate of ammonia by subjecting the illuminating gas to the action of sulphuric acid. But in other cases the losses are very considerable indeed, though much improvement in this respect has been effected in recent years, owing to the repeated attention directed to this subject by different writers in the Technical Press, as well as by these reports.

This question of loss of ammonia is, it is added, of the greater moment the longer the ammoniacal liquor is stored prior to distillation. In some of the smaller works, it is the custom to collect the production of liquor over a lengthened period—amounting to months in some cases—in order to obtain a quantity sufficient to keep the ammonia still in operation for a week or two, and so permit of its economical use, as much heat is lost at the starting and stopping of ordinary continuous distillation plants. In such cases, not only is there more opportunity of loss of ammonia compounds from the gas liquor, but there is also the tendency for the sulphur compounds present to oxidize through the influence of the air. The practical effect of this is to increase the proportion of "fixed" ammonia as distinguished from the "volatile" ammonia, and so to necessitate an increased consumption of lime or alkali for the complete removal of the ammonia present in the liquor. A layer of suitable oil covering the surface of the ammoniacal liquor when in the storage tanks should have the double effect of hindering the escape of ammonia and the oxidation of sulphur compounds, and is worthy of attention where the storage is prolonged, as giving increased yield of sulphate of ammonia with less consumption of lime or alkali.

### Quality and Cost.

The standard quality of British sulphate of ammonia has been the subject of discussion in the circles interested, some of the sulphate produced in this country prior to the war being said by foreign consumers to compare unfavourably to a marked degree

with the product received from Germany. The Sulphate of Ammonia Association Mr. Curphey understands, recently issued directions as to the conditions best calculated to ensure a satisfactory product; but there is wide room for inquiry and research on the seemingly simple question of the manufacture of sulphate with the object of getting the best product at low costs.

The question of efficient production is one which is likely to become more prominent as advance is made in the domain of synthetic nitrogenous fertilizer products, with attendant reduced costs, increased production, and more severe competition. This aspect of the question is, he says, one well worth attention now, apart from the questions of education as to advantageous utilization, of commercial distribution, and the opening of new markets, which have already been taken up with advantage, as all these must rest on the basis of a product high in quality and sufficiently low in cost. It is one which can, with the most hopeful of expectations and general advantage, be taken up by centralized effort.

### Miscellaneous Matters.

The preparation of sulphate of ammonia without the direct use of sulphuric acid by the utilization of the sulphur compounds existing in crude coal gas (referred to in previous reports) was not brought into practical working during the year; but it continued to receive attention, and satisfactory progress is still anticipated by the patentees.

No new method for disposing of the sulphuretted hydrogen given off during the distillation of gas liquor was introduced during the year. As hitherto, the oxide of iron purifier was most generally used; while the manufacture of sulphuric acid by the chamber process, recovery of sulphur by the Claus process, conversion into sulphuric acid with subsequent neutralization, and the formation of metallic sulphides, is continued in different works.

It is pointed out that last year the town of Middlesbrough arranged that its supply of illuminating gas should be obtained from a coke-oven works in the vicinity. This was effected and maintained without difficulty since the month of October until the end of the year; the operations in the gas-works being limited to the purification of the crude gas prior to distribution.

### Tar-Works.

With reference to tar-works, Mr. Curphey remarks that the number of this class of registered works further increased during 1914 by 13, to a total of 205. This increase was due to new plant being erected to deal with tar produced in gas-works, coke-oven works, and producer-gas works. Operations in many cases were seriously affected during the later months of the year, owing to the influence of war conditions on the export of tar products and materials in the preparation of which tar products are used.

Improvements in plant for tar distillation were brought into more extended operation during the year, with the view of increasing efficiency in production and reducing costs. Prominent among these were the increased utilization of the hot vapours rising from tar during distillation, for heating a fresh charge of crude tar, and thus obtaining a preliminary separation of water and naphtha, and the more extended use of continuous distillation plant for the production of pitch and volatile products. No new methods were brought into operation for disposing of the noxious gases evolved in these works. Those previously in use continued to be effective and satisfactory.

### Coming International Competition—Combination for Scientific Production.

The final passages of Mr. Curphey's report are as follows: The present condition in this country as to the manufacture of dyes has become very prominent lately; but this is only one of many instances to be observed in the United Kingdom where the industrial outlook suggests that more might have been done towards the development of different branches of chemical industry on scientific lines. It is more in harmony with the national character that each individual manufacturer should pursue his own course, be guided by his own judgment, and learn from his own experience—and the advantage of giving free scope to individual effort should not be lost sight of. But in proportion as co-operation becomes more possible a wider experience becomes available. It is well to weigh with the utmost seriousness the advantages and disadvantages of the pursuit of traditional methods when the nation is faced with the prospect of exposure to industrial competition of great severity at the close of the war—a competition which it may be anticipated will in many cases be not only strengthened by specialization accompanied by co-operative organization in allied manufactures, but be actively supported by the Central Government.

The idea of combined action is unfamiliar to many groups of manufacturers interested in particular chemical products; but, as a rule, combination has been confined hitherto to the commercial field, while little attention has been given to combined effort on the productive side. Indeed, there is frequently a feeling of objection to a frank interchange of views which might benefit a competitor. But it is a matter for serious consideration whether there is not scope in various directions for more centralized scientific guidance of industry, and whether questions relating to cost of production, recovery and utilization of waste material, improvement of product, &c., might not be considered by a capable technical adviser. It is true that work of this kind is already carried on in many individual cases with good effect on individual production; but when the general reputation in a foreign market of a British product suffers through inequalities in the deliveries from different British works, as has been asserted recently with regard to one prominent chemical product, it may be expedient for more advanced producers to consider the propriety of endeavouring to raise the general standard and to maintain not only the reputation of their own individual product but the reputation of the British product as a whole.

It may be difficult to bring into line the existing varying and conflicting interests and to modify the mental outlook in some cases; but much could be done in various branches of chemical manufacture by an efficiently staffed centre for research and for advice, apart from, and supplementary to, proper works control. The science of chemistry has developed so rapidly and extended so widely during past years, and its applications to industrial purposes have become so numerous and varied within a comparatively short time, that the importance of the properly qualified chemist is not appreciated, nor the requisite training and qualifications of the technical chemist so fully apprehended as they ought to be in many quarters, both inside and outside the industry. If our chemical industries are to be fully equipped for the coming international competition, it is essential that the conditions affecting production should be worked up to the highest efficiency, both as regards low costs and high quality. Such work can be most effectually developed under those who have received adequate scientific education and training, and who, by subsequent practice in manufacture, have acquired the experience that is essential to industrial success.

### The Late Revered Chief.

I desire to express my appreciation of the aid I have received from my colleagues and from Mr. Linder in carrying out the administration of the Act. It is a matter of deep regret that, while this report was in progress, Mr. R. Forbes Carpenter passed away on Feb. 1. He was appointed a Sub-Inspector under the Act in 1882, was promoted to be an Inspector in 1884, and to be Chief Inspector in 1895, on the retirement of Mr. A. E. Fletcher, who is still with us. Mr. Carpenter remained in office until 1910, when impaired health led to his retirement. He was a most pleasant colleague, most capable chief, and at all times a strenuous and conscientious worker. His passing has been the occasion of expressions of appreciation and esteem from numerous societies associated with industrial chemistry, where his personality and abilities were well known.

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Occasion will be taken subsequently to notice some of the points from the reports of the District Inspectors.

## BYE-PRODUCTS.*

The title of the book expresses the ground it covers, and one wonders whether it is intended to be a reference book for the technical man or a text-book for the student. Some chapters suggest the former; the elementary nature of others suggests the latter. Only the direct bye-products (*i.e.*, those which are removed in ordinary purification processes) are dealt with—viz., tar, ammonia, sulphur compounds, and cyanogen. A chapter is devoted to coke; but so far as the value of the information contained in it is concerned, it might as well have been omitted altogether. The section dealing with tar gives some useful information with regard to the elimination of water, and also of the methods employed in determining water in tar and other tests. Reference is made to various methods of tar distillation; but no information of particular value is given.

Perhaps the best section of the book, from the practical point of view, is the one devoted to the working-up of ammoniacal liquor. At the present time, when supplies of sulphuric acid are difficult to obtain, the information concerning the manufacture of concentrated liquor, strong, and liquefied ammonia will be especially appreciated. Fairly full details of these processes are given. The book, generally speaking, lacks illustrations of plant, apparatus, &c.; but in connection with the ammonia these are ample, and greatly enhance the value. The section devoted to the manufacture of sulphate of ammonia might well have been extended to include some notice of the direct-recovery systems now employed in nearly all coke-oven plants, and also on gas-works. No mention at all is made of these. Some detailed reference is given to the Feld and Burkheiser processes; and one would gather from the book that the working of them was unattended with any difficulties. Such, unfortunately, is not the case, and much remains to be done before they can be placed on the same footing as the ordinary direct-recovery processes.

Other chapters deal with the "Treatment of Gas Purifying Agents," "Cyanogen and its Compounds," "Sulphur and Sulphuric acid." The two latter subjects, by the way, are dealt with in about thirty lines; but there is nothing in any of these calling for special comment. Several references to patent specifications are made throughout the book.

It seems that the subject is one which might have been better treated, as it is a difficult matter to cover such ground adequately in so small a book.

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* "The Bye-Products of Coal Gas Manufacture." By K. R. Lange. Translated from the German by Charles Salter. London: Scott, Greenwood, and Son; 1915. [Price, 5s. net.]

# REFLECTIONS FROM FIELD'S "ANALYSIS."

"By Engineer."

As previously noted in the "Journal," there appeared early in June "Field's Analysis" for the year 1914; and the writer proposes to submit certain figures and tables following in general the line of a similar contribution in the issue of June 30 last year, which dealt with the 1913 figures. As in that case, the repetition of figures actually appearing in the "Analysis" will be avoided as far as possible.

This year the work comprises 35 undertakings—the welcomed new-comers being Widnes and Belfast. Enfield also appears—not as a separate entity, but swallowed-up by its larger neighbour at Tottenham.

## Increase in Gas Sold.

The issue of the "Journal" for June 15 gave a few interesting details of sales increases, but purposely left out Scotland and Ireland. Making due allowance for the three added businesses, the total sales have increased from 114,563 millions in 1913 to 116,647 millions in 1914—an increase of 2084 millions, or 1·82 per cent. This is satisfactory, having regard to the abnormal conditions. The largest increase is that of Birmingham—8·87 per cent., due probably to the increased prosperity of its manufactures owing to the war. Newcastle is second, with 7·31 per cent., and, of the others, only Lea Bridge and Glasgow have more than 5 per cent. increases. Five concerns have decreases—the worst being Leeds, with 6·26 per cent., which seems curious when one considers that it is a similar town to those above-mentioned which are enjoying increases. It is evident that the influx of great bodies of troops does not affect these large gas undertakings as it does the medium and smaller ones, as the writer knows of some who are enjoying increases of about 30 per cent.; though whether the enjoyment is shared by the responsible officials is another question.

## Sale of Gas per Consumer.

The article above referred to draws attention to the increased sale of gas per consumer in the corporations, and the decrease for London companies. This may be explained in the former case by increased uses in the commercial side, and also to the prosperity of the artizan. London has suffered by a partial stagnation—causing curtailment in all expenditure; and the increased price in the latter part of the year, coupled with a high average sale, would be sure to have the effect noted. It will be interesting to see the effect on these average sales of the almost universal increase in price during 1915.

The effect of cheap gas at Widnes is remarkable—the average per ordinary consumer being 120,543 cubic feet, and automatic 20,919. The only other concerns with an average of over 60,000 feet for ordinaries are:

| | |
|---|---|
| Birmingham | 91,335 |
| Commercial | 80,727 |
| South Metropolitan | 75,984 |
| Bristol | 62,539 |
| Gas Light and Coke | 61,708 |

The best figures for slots are (after Widnes):

| | |
|---|---|
| Wandsworth | 20,668 |
| Bristol | 20,434 |
| Leicester | 20,050 |
| Birmingham | 19,837 |

The lowest figures are, for ordinaries:

| | |
|---|---|
| Edinburgh | 20,534 |
| Bolton | 23,169 |
| Bradford | 23,751 |

And for slots:

| | |
|---|---|
| Edinburgh | 7,208 |
| Bradford | 7,516 |

It should be noted that the best figures on the averages of slots and ordinaries are two or three times that of the worst; and it certainly appears in many cases that there is room for considerable expansion of business without material increase of capital.

## The Daily Load Curve.

As pointed out last year, the ratio of yearly send-out to maximum day has improved by over 10 per cent. during the past ten years; and during the past year further points have been gained, notably the following:—

| | | | |
|---|---|---|---|
| Portsea | 27 points, | up to | 268 |
| Lea Bridge | 19 " | " | 250 |
| Rochester | 17 " | " | 260 |
| Salford | 16 " | " | 207 |

As ten concerns now have ratios of 240 and over, it is seen that, although we are not getting within measurable distance of our ideal figure of 365 (which is impossible), it does seem probable that many undertakings will before long reach 300, which may be looked upon as the maximum under normal conditions. Some concerns have lost in this respect—such as Plymouth (23), Dublin (22), Leicester (12), and Glasgow (10). These large increases and decreases may be due to war conditions.

## Carbonizing Results.

Following last year's article, Table "A" gives the order with regard to carbonizing results. So that the merit of the make per ton may be amended if necessary, the amount of oil per 1000 cubic feet in the water-gas plant is given; also any other enricher which may be used. The writer does not suggest that the best result is that necessarily marked No. 1, although in these times of dear coal every few cubic feet is of some account, and now that illuminating value is of decreased importance this extra make may pay in most works. Notable figures are:

*Gas.*—Commercial, 13,775 cubic feet to the ton.
*Coke.*—Carlisle C., 12·19 cwt. sold per ton.
*Tar.*—Oldham C., 13·4 gallons to the ton.
*Liquor.*—Nottingham C., 35·9 gallons of 10-oz. liquor to the ton.
*Gas.*—Five undertakings make over 13,000 cubic feet to the ton, and five make less than 11,000 cubic feet.
*Coke.*—Five undertakings make for sale over 11 cwt. to the ton, and six make under 9 cwt.
*Tar.*—Five undertakings make 12 gallons or over to the ton, and three make under 9 gallons.
*Liquor.*—Twelve undertakings make over 30 gallons to the ton, and two make under 20 gallons.

With regard to coke, it is well shown how the only figure of any account is the coke actually sold. Where coke only is taken, the coke "made" varies from 11·21 cwt. per ton to 13·47 cwt. Where breeze is included, the amount varies from 11·00 to 14·94 cwt., or, excluding Glasgow, it varies from 11·81 to 14·94 cwt. It is obvious that these figures are mostly inaccurate, for one cannot conceive one coal making 3 cwt. per ton more than another—that is, all being gas-making coals. Hence, the figure "Percentage of Coke used as Fuel" is a snare and a delusion; and the writer throws out a suggestion to the compiler that the first two columns may well be omitted. As the whole value of the carbonizing results appears in the net coal costs, Table "A" gives the order for this, together with the percentage of coal cost obtained from residuals.

## Influence of Water Gas.

By putting the percentage of water gas in the final column of this table, it is again clear that, as a general rule, happy is the undertaking that (by reason of its geographical position or other peculiarity) can do without the mixture. It is seen from the table that the following positions with regard to lowness of "net coal costs" are occupied by concerns making 6 per cent. or less:

Positions . . . 1, 2, 3, 4, 5, 6, 7, 8, 10, 12, 13, and 14.

At the other end, those making over 25 per cent. occupy:

Positions . . . 22, 23, 24, 26, 27, 29, 30, 31, 33, 34, and 35.

The big exceptions are Oldham making 3 per cent. and occupying position 20, and Richmond making none and occupying position 32.

## Costs Compared with 1913.

The following table shows how 1914 compared with the previous year with regard to carbonizing materials and residuals:—

| — | Pence per 1000 Cubic Feet Sold. | | | Net Coal Costs. Percentage Increase. |
|---|---|---|---|---|
| | Carbonizing Materials. | Residuals. | Net Coals. | |
| London | − 0·28 | − 2·48 | + 2·20 | 14·7 |
| Suburbs | − 0·11 | − 2·09 | + 1·98 | 12·1 |
| Provincial corporations | + 1·42 | − 1·00 | + 2·42 | 15·2 |
| Scotch corporations | + 2·22 | − 1·17 | + 3·39 | 18·4 |
| Provincial companies | same | − 1·83 | + 1·83 | 12·3 |
| Dublin | + 0·25 | − 0·71 | + 0·96 | 3·6 |

The dearer coals and cheaper residuals resulted in only twenty-two undertakings getting back more than half the cost of carbonizing materials, against 30 in 1913. The average percentage of $\frac{\text{Residual Receipts}}{\text{Coal, \&c., Costs}}$ was only 56 in 1914, against 68 in 1913. High residuals enables Widnes to attain position No. 1 in this column of Table "A," whereas dear coal and low residuals again puts Rochester at the bottom.

## Factors which Count for Success.

Table B [similar to that appearing last year] gives the position in order of merit with regard to the factors which may be said to count for success in selling gas at a low price. The names are placed in order of lowness of price—the lowest being No. 1, and so on. The price is here arrived at by adding the net gas rental to the meter rent, as the amount of these rents (if any) affects the price at which gas can be sold.

Capital.—In the table nominal additions are deducted, and all necessary adjustments made. For municipal undertakings the full debt is taken in the first column relating to capital, and the outstanding debt only is considered in the following column.

Repairs.—In the column including repairs, any contributions from special funds in lieu of repairs and renewals are added.

Percentage of Gas Sold.—In this column the concern showing the largest proportion of its made gas actually sold is placed No. 1. Leakage and used-on-works is deducted.

The difference between the selling prices of gas between No. 1 and No. 35 is even more remarkable than it was last year. No. 1 (Widnes) is about 12·75d. per 1000 cubic feet; and No. 35

TABLE A.

| Undertaking. | Position Occupied with Reference to: Gas Made per Ton. | Coke for Sale per Ton. | Tar Sold per Ton. | Liquor Made per Ton. | Gallons of Oil per 1000 Cubic Feet of C.W.G. | Gallons of Enricher Used per Million Cubic Feet of Total Gas Make. | Percentage of Coal Costs Obtained for Residuals. | Position Occupied with Regard to Same. | Position Occupied in List with Regard to Net Coal Costs. | Percentage of C.W.G. Made. |
|---|---|---|---|---|---|---|---|---|---|---|
| Gas Light | 11 | 17 | 16 | 15 | 2·26 | *Nil* | 54·9 | 16 | 17 | 26 |
| Commercial | 1 | 5 | 13 | 5 | 2·17 | *Nil* | 48·3 | 24 | 22 | 31 |
| South Metropolitan | 9 | 30 | 25 | 2 | * | *Nil* | 61·8 | 13 | 13 | *Nil* |
| Brentford | 14 | 13 | 17 | 17 | 2·19 | *Nil* | 41·5 | 29 | 24 | 42 |
| Croydon | 6 | 16 | 21 | 3 | 2·23 | *Nil* | 48·3 | 25 | 27 | 27 |
| Hornsey | 2 | 10 | 23 | 13 | 2·29 | *Nil* | 38·3 | 32 | 31 | 37 |
| Lea Bridge | 5 | 35a | 5 | 28 | 2·53 | *Nil* | 33·5 | 34 | 29 | 49 |
| Richmond | 16 | 21 | 19 | — | * | *Nil* | 53·3 | 20 | 32 | *Nil* |
| South Suburban | 4 | 9 | 24 | 9 | 2·26 | *Nil* | 49·8 | 23 | 25 | 15 |
| Tottenham | 3 | 25 | 18 | 21 | 2·24 | *Nil* | 38·8 | 31 | 26 | 31 |
| Wandsworth | 8 | 7 | 22 | 11 | 2·34 | *Nil* | 54·7 | 18 | 21 | 11 |
| Birmingham C. | 18 | 19a | 11 | 6 | 3·23 | 8·3 | 64·7 | 10 | 9 | 14 |
| Bolton C | 27 | 3a | 2 | — | * | *Nil* | 69·6 | 5 | 6 | *Nil* |
| Bradford C | 30 | 26a | 3 | 19 | * | *Nil* | 68·3 | 7 | 8 | *Nil* |
| Carlisle C | 25 | 1a | 4 | 14 | 3·30 | *Nil* | 63·8 | 11 | 15 | 9 |
| Leeds C. | 31 | 20a | 12 | 23 | 2·38 | *Nil* | 68·6 | 6 | 5 | 6 |
| Leicester C. | 12 | 6a | 10 | 10 | 2·16 | *Nil* | 54·9 | 17 | 16 | 9 |
| Manchester C | 23 | 11a | 9 | 4 | 2·21 | 2·2 | 61·4 | 15 | 11 | 17 |
| Nottingham C | 15 | 31a | — | 1 | 2·98 | *Nil* | 83·8 | 2 | 2 | 2 |
| Oldham C | 13 | 8a | 1 | 18 | 2·57 | 66·7 | 53·3 | 21 | 20 | 3 |
| Salford C | 28 | 22a | 8 | 8 | * | *Nil* | 65·9 | 9 | 7 | *Nil* |
| Widnes C | 29 | 4a | 15 | — | * | *Nil* | 89·6 | 1 | 1 | *Nil* |
| Edinburgh C | 32 | 14a | 7 | — | 2·68 | *Nil* | 62·3 | 12 | 14 | 1 |
| Glasgow C | 35 | 12a | — | — | * | *Nil* | 66·3 | 8 | 12 | *Nil* |
| Belfast C | 10 | 2a | 6 | 16 | 1·81 | *Nil* | 52·2 | 22 | 19 | 42 |
| Bath | 34 | 15 | 33 | 22 | 2·32 | *Nil* | 54·2 | 19 | 18 | 22 |
| Brighton | 7 | 27 | 14 | 24 | 2·37 | 12·4 | 46·3 | 26 | 23 | 34 |
| Bristol | 22 | 32 | 20 | 20 | 2·86 | 32·8 | 44·8 | 27 | 28 | 17 |
| Derby | 26 | 33 | 26 | 7 | * | 1·8 | 72·5 | 4 | 4 | *Nil* |
| Newcastle | 19 | 23 | 27 | 27 | 2·37 | *Nil* | 61·7 | 14 | 10 | 4 |
| Plymouth | 17 | 34 | 29 | — | 2·48 | *Nil* | 37·3 | 33 | 30 | 33 |
| Portsea | 33 | 18 | 32 | 26 | 2·77 | *Nil* | 42·2 | 28 | 33 | 37 |
| Rochester | 21 | 24 | 28 | 29 | 2·83 | *Nil* | 23·3 | 35 | 35 | 41 |
| Sheffield | 20 | 28a | 30 | 12 | * | *Nil* | 79·1 | 3 | 3 | *Nil* |
| Dublin | 24 | 29 | 31 | 25 | 2·59 | *Nil* | 41·2 | 30 | 34 | 30 |

Undertakings marked "C" are Municipal. Where blanks are shown, no figures are furnished under that heading. "a" Means breeze is included. * Means no water gas.

TABLE "B."

| Position as to Size. | Undertaking. | Position Occupied with Regard to: Lowness of Price (Gas Rental + Meters). | Capital Employed per Million: Taking Full Loans for Municipal Undertakings. | Capital Employed per Million: Taking only Outstanding Loans for Municipal Undertakings. | Net Coal Costs. | Carbonizing and Purifying Wages. | Total Working Expenses, less Repairs and Net Coals. | Ditto, including Repairs and Special Funds. | Percentage of Gas Sold, after deducting Leakage and Works Use. | Gas Sold per Mile of Main. | Gas Sold per Consumer. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 32 | Widnes C | 1 | 2 | 4 | 1 | 25 | 8 | 3 | 16 | 6 | 1 |
| 6 | Sheffield | 2 | 1 | 7 | 3 | 18 | 3 | 4 | 9 | 9 | 3 |
| 3 | Birmingham C. | 3 | 3 | 6 | 9 | 12 | 5 | 6 | 5 | 2 | 2 |
| 13 | Belfast C | 4 | 17 | 5 | 19 | 15 | 2 | 2 | 28 | 26 | 23 |
| 26 | Plymouth | 5 | 7 | 13 | 30 | 2 | 1 | 1 | 8 | 3 | 11 |
| 22 | Oldham C | 6 | 19 | 9 | 20 | 20 | 7 | 12 | 27 | 17 | 25 |
| 18 | Bradford C | 7 | 27 | 10 | 8 | 27 | 12 | 7 | 24 | 30 | 29 |
| 4 | Glasgow C | 8 | 4 | 3 | 12 | 34 | 17 | 16 | 32 | 15 | 28 |
| 7 | Newcastle | 9 | 31 | 32 | 10 | 26 | 16 | 8 | 21 | 31 | 22 |
| 29 | Bath | 10 | 9 | 15 | 18 | 16 | 9 | 10 | 6 | 25 | 5 |
| 5 | Manchester C | 11 | 23 | 2 | 11 | 10 | 19 | 11 | 13 | 19 | 19 |
| 10 | Bristol | 12 | 25 | 29 | 28 | 13 | 4 | 5 | 18 | 7 | 4 |
| 20 | Salford C | 13 | 28 | 11 | 7 | 24 | 24 | 14 | 15 | 23 | 30 |
| 28 | Derby | 14 | 15 | 20 | 4 | 17 | 6 | 19 | 30 | 24 | 18 |
| 34 | Carlisle C | 15 | 14 | 1 | 15 | 35 | 32 | 13 | 10 | 32 | 27 |
| 11 | Leeds C. | 16 | 32 | 24 | 5 | 32 | 26 | 18 | 23 | 34 | 31 |
| 12 | Wandsworth | 17 | 8 | 14 | 21 | 14 | 13 | 30 | 29 | 10 | 9 |
| 14 | Tottenham | 18 | 13 | 19 | 26 | 9 | 18 | 23 | 25 | 14 | 21 |
| 2 | South Metropolitan | 19 | 11 | 17 | 13 | 21 | 30 | 29 | 11 | 4 | 7 |
| 16 | Leicester C | 20 | 30 | 21 | 16 | 8 | 10 | 9 | 2 | 12 | 10 |
| 8 | Brentford | 21 | 6 | 12 | 24 | 6 | 21 | 22 | 19 | 11 | 14 |
| 27 | Bolton C. | 22 | 33 | 33 | 6 | 31 | 27 | 15 | 3 | 33 | 34 |
| 15 | Nottingham C | 23 | 24 | 28 | 2 | 7 | 14 | 25 | 4 | 21 | 24 |
| 9 | Commercial | 24 | 12 | 18 | 22 | 3 | 22 | 24 | 33 | 1 | 17 |
| 21 | Croydon. | 25 | 18 | 23 | 27 | 5 | 28 | 26 | 14 | 20 | 8 |
| 1 | Gas Light | 26 | 26 | 30 | 17 | 11 | 11 | 28 | 26 | 5 | 12 |
| 19 | Edinburgh C | 27 | 35 | 34 | 14 | 4 | 25 | 20 | 17 | 29 | 35 |
| 17 | South Suburban | 28 | 21 | 26 | 25 | 1 | 29 | 27 | 20 | 22 | 16 |
| 23 | Portsea | 29 | 5 | 8 | 33 | 30 | 15 | 21 | 22 | 16 | 20 |
| 30 | Rochester | 30 | 10 | 16 | 35 | 29 | 20 | 17 | 34 | 27 | 26 |
| 35 | Richmond | 31 | 22 | 27 | 32 | 28 | 34 | 31 | 31 | 8 | 6 |
| 24 | Brighton | 32 | 20 | 25 | 23 | 33 | 31 | 33 | 1 | 13 | 13 |
| 31 | Hornsey | 33 | 16 | 22 | 31 | 19 | 23 | 34 | 7 | 18 | 15 |
| 33 | Lea Bridge | 34 | 29 | 31 | 29 | 23 | 33 | 35 | 12 | 28 | 33 |
| 25 | Dublin | 35 | 34 | 35 | 34 | 22 | 35 | 32 | 35 | 35 | 32 |

The size in first column refers to "Sale of Gas" in order of Magnitude.

TABLE "C."

| Undertaking. | Percentage Automatic Consumers / Total Consumers | Ratio of Sale Average Ordinary Consumer / Average Automatic Consumer | Percentage Total Stoves and Fires / Total Consumers |
|---|---|---|---|
| Gas Light | 62·5 | 4·1 | 79 |
| Commercial | 78·5 | 5·6 | 68 |
| South Metropolitan | 73·5 | 3·9 | 97 |
| Brentford | 69·0 | 3·0 | 95 |
| Croydon | 51·0 | 2·6 | 96 |
| Hornsey | 35·5 | 2·6 | 45 |
| Lea Bridge | 64·5 | 2·6 | 75 |
| Richmond | 41·0 | 3·0 | 77 |
| South Suburban | 51·5 | 3·1 | 95 |
| Tottenham | 71·5 | 3·1 | 62 |
| Wandsworth | 64·5 | 2·8 | 89 |
| Birmingham C | 54·5 | 4 6 | 76 |
| Bolton C | 27·0 | 2·5 | 46 |
| Bradford C | 4·5 | 3·7 | 1 |
| Carlisle C. | 51·5 | 3·3 | 7 |
| Leeds C | 45·5 | 3·2 | 32 |
| Leicester C | 62·5 | 2·8 | 94 |
| Manchester C. | 38·0 | 3·1 | 64 |
| Nottingham C | 51·5 | 3·1 | 41 |
| Oldham C. | 13·0 | 2·6 | 44 |
| Salford C | 43·0 | 3·1 | 15 |
| Widnes C | 64·0 | 5·8 | 36 |
| Edinburgh C | 13·0 | 2·9 | 17 |
| Glasgow C | 30·5 | 2 8 | 56 |
| Belfast C | 39 0 | 3·5 | 30 |
| Bath | 22·5 | 3·0 | 69 |
| Brighton | 33·0 | 2·7 | 98 |
| Bristol | 47·0 | 3·1 | 83 |
| Derby | 64·0 | 3·7 | 64 |
| Newcastle | 57·0 | 3·9 | 70 |
| Plymouth | 50·5 | 3·6 | 57 |
| Portsea | 59·5 | 2·6 | 64 |
| Rochester | 53·0 | 2·3 | 58 |
| Sheffield | *Nil* | — | 10 |
| Dublin | 75·0 | 6·6 | 80 |

(Dublin), 41·61d.—a difference of nearly 29d. per 1000 cubic feet. This difference is partially accounted for as follows:

| | | |
|---|---|---|
| Net coals | 11·6d. | per 1000 cubic feet. |
| Capital requirements | 4·7 | " " |
| Wages and working expenses | 3·8 | " " |
| Repairs and renewals | 6·2 | " " |

The remainder is swallowed-up in exceptional charges.

### DEBT, &c., OF MUNICIPAL UNDERTAKINGS.

The short table on p. 751 gives the amount of the outstanding debt stated as a percentage of the total debt, and also indicates the amount, in pence per 1000 cubic feet, transferred to the aid of the rates.

The average rates of municipal undertakings is 1·91d., against an average of 2·08d. per 1000 cubic feet for the companies, or 1·28d. per 1000 cubic feet for the companies excluding the three London ones.

Reverting to Table "B," there are some remarkable differences in results. Thus purification charges varied from 0·02d. (Manchester) to 1·37d. (Portsea). Carbonizing wages, &c.," varied from 1·26d. (South Suburban) to 3·81d. (Carlisle). The total expenses of running the undertaking, apart from net coals and

| — | Outstanding Debt Capital Employed | Aid of Rates. Pence per 1000 Cubic Ft. |
|---|---|---|
| Birmingham | 65·6 per cent. | 1·75 |
| Bolton | 88·9 ,, ,, | 4·29 |
| Bradford | 58·3 ,, ,, | 0·58 |
| Carlisle | 8·8 ,, ,, | 2·54 |
| Leeds | 62·6 ,, ,, | — |
| Leicester | 71·6 ,, ,, | 1·04 |
| Manchester | 34·2 ,, ,, | 2·17 |
| Nottingham | 99·2 ,, ,, | 4·21 |
| Oldham | 72·2 ,, ,, | 1·18 |
| Salford | 59·2 ,, ,, | 0·41 |
| Widnes | 72·7 ,, ,, | 0 87 |
| Edinburgh | 81·6 ,, ,, | — |
| Glasgow | 62·7 ,, ,, | — |
| Belfast | 42·6 ,, ,, | 2·22 |

repairs, varied from 4·56d. (Plymouth) to 10·95d. (Dublin). The variation in the percentage of gas sold, after deducting leakage and works use, is 95·76 (Brighton) to 85·82 (Dublin), or nearly 10 per cent., which in itself is sufficient to account for some pence in the necessary price charged for gas. The maximum sale per mile of main is 11·6 millions (Commercial), and the minimum is 2·2 millions (Dublin); while the average sale per consumer varied from 57,208 cubic feet at Widnes down to 18,835 cubic feet at Edinburgh. The position of Newcastle in this table is peculiar. It occupies No. 9 in relation to lowness of price, yet apparently shows very indifferently with regard to those factors which should cause it.

Table "C" gives one or two details regarding consumers and stoves, the third column of which is taken direct from "Field." This column shows that Brighton has the remarkable figure of 98 stoves to every 100 consumers; South Metropolitan following with 97. In these cases, as in three others, the number of ordinary stoves and fires is more than the consumers. In this respect many undertakings can do with energetic propaganda work.

Owing to the interruption of public lighting, no details are given this year with regard to it.

## COKING AND BYE-PRODUCTS.

**By "Event and Comment."**

### Benzol Recovery and Tests.

Reference was made in these notes a fortnight ago to the difficulty of carrying out a really satisfactory test for determining the amount of benzol contained in coke-oven gas. In the case of any manufacturing process of this kind, it is highly desirable to have some sort of check on the working of the plant, but generally speaking little, if any, trouble is taken to apply this in ordinary benzol recovery. Various tests have been suggested, and many have been described in the Technical Press. Perhaps the best known of these consists in passing (say) 10 cubic feet of gas through a series of wash bottles. The gas is first passed through sulphuric acid, then through caustic potash solution, over calcium chloride, and then through a series of absorption bottles containing specially prepared paraffin oil. The gas is passed through at the rate of about 1 cubic foot per hour, and the absorption bottles are cooled in a freezing mixture of ice and salt, in order to obtain the best conditions for benzol extraction. The bottles are weighed before and after the test; and from the increase in weight, the amount of benzol can be calculated. The volume of gas is measured by means of a meter. This test is used both for rich gas and weak gas—*i.e.*, before and after the extraction of benzol. There are many obvious objections to this method, and, in the writer's opinion, the most important of these is that the method of testing differs very widely from the method actually employed in practice.

It is desirable, in doing any such test, for the conditions under which the test is made to be as nearly as possible the same as those which obtain in the normal working of the system. If this is not the case, various allowances have to be made, the real magnitude and importance of which are usually matters of speculation only, and cannot be made on a really scientific basis. This applies to all such tests as the one described, and also to the one in which nickel salts are used. What is wanted, therefore, is a test which is directly representative of the actual method employed on the plant. Literally, we do not want to know how much benzol is in the gas, but how much can be recovered; and in order to get at this, actual working conditions must as far as possible be reproduced. Let us consider for a moment how far the above described test does this. In the first place, the quantity of gas is far too small for any really reliable result to be obtained. Say, for example, that the yield of gas is 10,000 cubic feet per ton of coal carbonized, and that the benzol content is 10 litres per ton of coal [litres are taken instead of gallons for the purpose of simplifying calculations and figures]. If 10 cubic feet of gas are taken, the benzol content of this is 10 cc. It is not at all satisfactory to have to give an average result on such small quantities as these. In the test, too, the absorption temperature is about 0° C., whereas in practice the temperature rarely falls below 10° to 15° C., and is frequently as high as 25° C. Added to this, the absorbent liquid is not the same as is used in practice, and it is hardly fair to assume that the absorbed constituents are quite the same.

The writer, therefore, in view of the above objections, adopts the following plan: 100 cubic feet of gas are taken, passing through at the rate of about 2 cubic feet per hour. The gas is taken after the absorption of the ammonia, and, if still warm, is passed through a cold water wash-bottle, thereby reducing its temperature to about that of the atmosphere. Ordinary creosote oil is used as the absorbent. It is necessary to prepare this oil carefully before use, so that no distillate comes over below about 200° C. Three or four wash-bottles containing glass beads are used to contain the oil, and a large surface of contact is thereby obtained, corresponding to the conditions inside a benzol scrubber filled with the usual wooden grids. The quantity of oil used for absorption is so arranged as to give a rich oil of approximately the same saturation as is usual on a benzol plant—*i.e.*, about 4 per cent. distilling below 135° C. In the present case, assuming the figures given above, from 100 cubic feet of gas we should have 100 cc. of benzol, and to give 4 per cent. saturation we should require 2400 cc. of creosote oil. This quantity should not all be put in the wash-bottles at once, but the oil should be renewed from time to time, especially that in the first wash-bottle. At the end of the test, the oil from all the bottles is mixed together, the beads and bottles washed with a little fresh oil, the whole well mixed, and a portion distilled in the usual way as rich oil. Not less than 250 cc. of oil should be taken, so that about 10 cc. of distillate would be obtained, and so error in reading the volume of a small quantity of liquid would be practically eliminated. The chemist doing the test has usually some idea of the quantity of benzol expected to be in the gas, and he can adjust his quantity of gas and oil in accordance with the above. If he has no idea of the benzol test, it is desirable that a preliminary test be made to determine this.

The test outlined can, of course, be equally applied with both rich and debenzolized gas. If any guarantees are given for the efficiency of benzol absorbing apparatus, 90 or 95 per cent. is usually the limit. On this basis, the benzol content in the end gas in the above case would be 0·05 to 0·1 cc. per cubic foot; so that a correspondingly larger quantity of gas should be used in the test. It is very desirable, from the point of view of economical working, that frequent tests should be made on the end gas, particularly if an inferior oil is used. If a high benzol content is found, the cause of the trouble should be located at once, though it is usually found to lie with the quality of the oil.

### Coke-Oven Gas at Middlesbrough.

The announcement made by Mr. Calvert, the Chairman of the Middlesbrough Gas Committee, that as a result of using coke-oven gas for town purposes a saving of £27,000 will result to the town during the next twelve months [see last week's "Journal," p. 712] will no doubt be of some considerable interest to those gas engineers who are faced with the difficulties of increased prices of coal at the present time. Many engineers were very sceptical with regard to the Middlesbrough scheme, and many objections were raised to it. The originators could, of course, advance many arguments in its favour; but the writer does not think that the present state of affairs had come within the contemplation of its supporters. A saving of £27,000 in a year's working to a town of the size of Middlesbrough is no small item; and the writer would not be at all surprised to hear of other engineers reducing their coal bill by obtaining coke-oven gas in bulk if possible. Middlesbrough has now had a fair trial of the scheme, and the writer believes that, at any rate as far as the gas is concerned, the town authorities have no complaints to make.

## GAS-FURNACES.

**Concluding Lecture at the Newcastle Exhibition.**

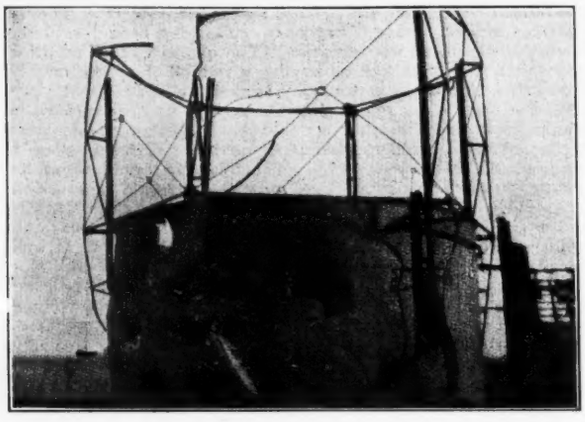
The last of the series of lectures in connection with the gas-furnace exhibition at Newcastle-on-Tyne, was given yesterday week by Mr. E. Russell Brayshaw, of Manchester, who took for his subject "The Heat Treatment of Carbon Tool Steel."

Mr. Brayshaw described, in detail, the changes which occur in steel when subjected to slightly varying heat treatment. Accuracy of treatment, he said, was ensured by means of the Brayshaw salt-bath furnace, by which an error of less than 1° C. could be detected. As an example, a number of bars were heated to near the hardening point, and then quenched. The bars heated to 735° C. came out soft; those heated to 740° C. came out hard. Within 5° the change took place—the fracture completely altering, and the elastic limit and bending test indicating a complete change from dead-soft to glass-hard.

The lecturer described a heating and cooling curve, showing the point of recalescence, and explained the bearing of this upon steel hardening. Part of the research referred to was carried out in conjunction with Sir Robert Hadfield, who cast special ingots and undertook many of the physical tests. The aim of the experiment was to place the hardening of tool-steel on a mechanical basis to eliminate the operator's errors of sight and judgment, and, in place, to give him figures to work to, so as to put him on a level with the machine operator who works to known dimensions. It is claimed that this has been achieved, and the various types of Brayshaw furnace in extensive use in many countries of Europe certainly support the claim.

## DAMAGE TO GAS-WORKS BY WAR.

The following illustration is reproduced from the "Journal für Gasbeleuchtung" of the 12th inst.—taken from a photograph forwarded to that journal by a German gas engineer serving at the front. It shows the damage suffered by a gasholder, somewhere in Flanders, which has been exposed to heavy gun as well as rifle fire.



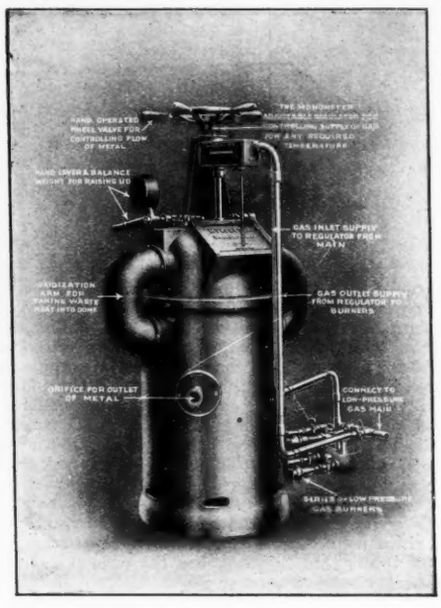
The Instructional and Experimental Works of the German Association of Gas and Water Engineers has issued a statement on the general question of the damage which gas-works may suffer through military operations. This statement points out that gasholders are the most vulnerable plant on a gas-works, but that the common impression that the destruction of a gasholder by shell fire is followed by an explosion of its contents is groundless, as has indeed been known since the time of Clegg. An explosive mixture cannot be present in either a gasholder or a distributing system which is in normal use. The manner in which the gas burns away quietly from a damaged holder has been seen, in the course of the present war, at the gas-works at Mulhouse in Alsace and Münster in Upper Alsace [*vide* "Journal," Vol. CXXVIII., p. 285, and *ante* p. 697]. But the interruption of gas supply which may ensue from damage to a gasholder may result in accumulations of gas occurring in buildings in the district through the escape of gas from open taps when the supply is resumed. The statement points out that the public should therefore be instructed to at once turn off all gas-taps in the event of any interruption of the gas supply, to keep them closed until notified of the resumption of supply, and to report cases where a smell of gas is observed.

## MELTING ALUMINIUM BY GAS.

The application of aluminium and its alloys to industrial purposes has extended so considerably in recent years that it will be of interest to describe a gas-fired furnace for melting these metals which has been evolved (in place of open crucibles) after many experiments by the Monometer Manufacturing Company, Limited, Whitehouse Street, Aston, Birmingham.

Melting-pots made of metal are, it is pointed out, subject to the objection that the reaction which takes place between the molten aluminium and the impurities in the metal of which the pot is composed spoils the aluminium. In the furnace in question this reaction is eliminated by the employment in the parts subject to attack of a special composition of metal which extended experience has shown to be impervious to the action of impurities. It is, the makers say, well known that a considerable portion of the molten metal goes to waste as oxide; and to prevent this deleterious action the melting-pot is installed in a chamber containing inert gases incapable of oxidizing the molten metal. As there is no oxidation, it follows that there is no dross, and hence a considerable saving of material. The method of constantly replenishing the enclosed melting chamber with inert gases consists in causing the products of combustion to traverse the melting chamber on their way to the outlet flue. This sealing of the melting chamber precludes, further, the ingress of dirt and other foreign matter in the melting-pot.

In connection with the heating arrangements a device is used in order to regulate the gas supply when the melting-point of the metal has been reached. The thermostat of the patented regulator, termed by the makers a "Monometer," controls and governs the quantity of gas supplied to the burners, so that immediately the aluminium is melted the quantity of gas passing the burners is reduced, and the uniform heat essential to the melting of aluminium is automatically maintained. The bunsen burners under the melting pot have contracted nozzles of such a design that a proper admixture of the gas and air takes place, resulting in perfect combustion and the full utilization of the heat in the fuel. The heat obtained by these low-pressure atmospheric burners, which are coupled to the ordinary town supply, is stated to be comparable with that attained by high-pressure gas, but without using compressors or fans.


HAND-OPERATED WHEEL VALVE FOR CONTROLLING FLOW OF METAL
HAND LEVER & BALANCE WEIGHT FOR RAISING LID
GAS INLET SUPPLY TO REGULATOR FROM MAIN
GAS OUTLET SUPPLY FROM REGULATOR TO BURNERS
ORIFICE FOR OUTLET OF METAL
CONNECT TO LOW-PRESSURE GAS MAIN

**The "Monometer" Aluminium Furnace.**

The equipment of the furnace is completed by a central cone-valve seated in the bottom of the melting-pot, and controlled by a conveniently arranged hand-wheel, by which the molten metal issuing from the pouring-spout can be regulated to a nicety or entirely shut off. At the top of the furnace there are two doors, through which the swarf or metal is introduced into the melting-pot; the doors being balanced so that they remain either in the closed or open position without being held by the operator.

Casting is facilitated by mounting the furnace on a wheeled carriage which can readily be moved on the rails from one part of the foundry to another; flexible gas-pipes providing the means for allowing for this movement of the furnace.

## TAR AND PITCH IN ROAD CONSTRUCTION.

At the Annual Meeting of the Municipal and County Engineers last Friday, Mr. A. Dryland, the Surveyor to the Surrey County Council, read a paper on "Tar, Pitch, and Bitumen in Road Construction;" and we extract below his remarks upon the subject of tar and coal-tar pitch.

Dealing with coal tar, the author stated that this most useful material had been to a great extent the salvation of our roads during the past few years, and still had a great part to play. In the surface treatment of roads it had largely eliminated the dust trouble, and had further considerably increased the durability of waterbound macadam; while in the production of tar macadam it had been a necessary ingredient in the manufacture of a material that had produced excellent road surfaces for all but the very heaviest traffic. A point which was well worth discussion by the Institution was the kind of tar which should be used in particular circumstances; and for the purposes of eliciting such discussion the author unhesitatingly put forward the view that for surface treatment of waterbound roads a good quality water-freed crude tar served every necessary purpose, and in its penetrative power was superior to distilled tars. It should be said, however, that its use should be avoided where from any cause, such as the vicinity of fishing streams, ponds, or watercourses readily reached by tar washings, it might involve risk. Whether distilled tar or water-freed tar only should be used to produce the tar macadam, depended on whether it was to be immediately used or stored.

As to coal-tar pitch, during the last few years a great deal of this material had been used fluxed with heavy oils of tar for the purpose of grouting macadam. The author had executed a good deal of this work, and had seen large areas of it in other counties. He had formed the opinion that it was an unsuitable material for surface work, chiefly owing to its susceptibility to heat, which permits of such movement of the material in hot weather as to destroy the evenness of surface which is so desirable in a road, and, moreover, impairs its waterproofness to such a material extent that winter conditions act most unfavourably upon it. Its softness in summer was in great contrast to its extreme hardness in winter (where it remains waterproof); and the author had had more complaints of slipperiness than on any other kind of surface he had laid.

The view was put forward that the method of pitch-grouting as

now practised was a crude and unsuitable way of using the material, inasmuch as far too great a quantity of the matrix is so used. If pitch and oil were to be successfully used as binding ingredients, they should be employed with properly dried and heated stone in a suitable mixer where the quantity of matrix could be properly regulated and the minimum quantity used to coat the stone. It would be found by this method that the matrix could be reduced by nearly 50 per cent. It was largely the great quantity of matrix used in the grouting method, without any certainty of the regular and proper coating of the stone, which had led to the unsatisfactory results on heavily trafficked roads which the author had found in so many cases, and not least in his own experience. A well-regulated pitch and oil mixture, properly applied to thoroughly dry and heated stone, formed a very strong macadam; but Mr. Dryland prefers to use it as a strength coat or base for material less susceptible to sun heat.

Cases were known in towns, where the traffic was necessarily slow and where there was less exposure to the sun, and facilities existed, such as prompt "chipping" or watering, for mitigating the effects of heat, where considerable success had been achieved by the grouting method; but here, again, one came to particular circumstances. While therefore the author asserted that it was not a satisfactory method for exposed country roads subjected to heavy and fast traffic, he was not prepared to say that its use should be abandoned where the local conditions permitted of success. Even in these cases, however, it was suggested that the excess of matrix which was almost inherent in the system of grouting was a disadvantage.

### DISCUSSION.

Mr. W. A. Farnham (Sidcup) called attention to the strong recommendation of the author to use crude gas tar. In his opinion, dense crude gas tar was undoubtedly the best surface resin. Refined or distilled tar had many defects, and he was not an advocate of its use. Therefore, it came to him as a considerable surprise not long ago when he received from the Road Board a request that future tarred paving should be limited to distilled tar, because crude tar was required for high explosives. He felt, however, that as the Government had every facility for commandeering all the crude tar they required, he was justified in using crude tar where he could obtain it; and the fact that he was able to get it at a cheaper price than last year, showed that there was not a very great demand for it.

Mr. H. F. Gullan (Belfast) agreed with the author when he stated that the question of whether distilled tar should be used in the production of tar macadam really depended upon whether it was to be employed immediately or stored. Distilled tar was an excellent medium if the tar macadam was stored. The real question in the use of tar in any form, however, was what was good tar, and was it possible to know a good tar when one had it. He mentioned this, because not very long ago, when he was doing some tar spraying, he obtained three samples of proprietary articles and sent them to his chemist to be tested, together with a tar from the Belfast Gas-Works. The result of the test was that the three proprietary articles were very much of the same standard, but as compared with the Road Board specification they were very inferior. A test of his own gas-works distilled tar showed slightly better results; but still they did not come up to the Road Board specification. These demonstrated the difficulties of knowing what was a good tar.

Mr. Hadfield (Sheffield) had tried many experiments, and had found that, when using distilled tar, the best results were obtained when the macadam was stored before use, preferably as long as a month.

Mr. H. E. Stilgoe (Birmingham) said that last year he used 1500 tons of coal-gas tar, free from water and light oils. This was employed for tar spraying macadam roads, and it answered its purpose very well indeed. As to the tar used in mixing tar macadam, he agreed that much depended upon whether or not the material was to be used immediately. Twenty-five years ago, when tar macadam was mixed by mixing the tar with the stones after the latter had been heated, they usually stored the material for six months, and it was all the better for it.

Mr. C. F. Gettings (Worcestershire) said it would be interesting if the author gave an analysis of the crude tar which he himself used. Most road engineers hitherto had assumed that all tars were quite good. From his own experience, however, he had found it was absolutely necessary to take frequent samples and have them analyzed in order to know exactly the constitution of the tar. He was now using a special, although well-known, plant for dehydrating his tar; but the chief difficulty arose when endeavouring to mix tars obtained from three or four different works, because no gas engineer would give a definite analysis from one week to another.

Mr. A. J. Lyddon (the Deputy Council Surveyor of Essex) said that apparently, from a circular which had been sent round by the Road Board, the use of crude tar was practically prohibited for the present.

Owing to illness the author was absent, and was consequently unable to reply to the discussion.

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The late Mr. Joshua J. Horton, who owned a gasholder building business at Smethwick, left estate valued at £115,088 gross, with net personalty £99,039.

## THE GAS COMPANY AND THE DEALER.

On the occasion of the Mid-Year Conference of the National Commercial Gas Association in the Auditorium of the Consolidated Gas Company, New York, on June 10, Mr. George B. Cortelyou, the President of the Consolidated Gas Company, was responsible for the following remarks on the subject of the "Relations between the Gas Company and the Dealer."

You have selected a general topic for discussion; but I note that, in addition, you have provided for a publicity session, for an educational session, and have afforded opportunities for the interchange of views on quite a variety of questions. I therefore feel free to devote my brief remarks to subjects which, though they may not relate directly to some of the headings of your programme, are, nevertheless, fruitful in suggestion to those engaged in the work of the National Commercial Gas Association and to all who have had to do intimately with the affairs of large business enterprises—particularly those of the public utility class.

For instance, we have heard not a little of late of the desirability of more uniform legislation throughout the country upon matters affecting public utilities; and various efforts have been made to bring this about. Some progress has been made, and considerable further progress is probably within the realm of practical achievement. But the difficulty of bringing into exact alignment the various States, each with independent jurisdiction, is likely to prove so great as to stand in the way of a completely uniform system of legislation. Nevertheless, there is ground for the hope that substantial uniformity may be secured—at least, as to fundamentals; and in this hope is found the encouragement for continued effort.

So far as public utilities are concerned, the *régime* of regulation has come to stay; and there are probably few of us who would now object to it in principle. The best service we can render to the public, as well as to ourselves, is to do what we can to see that regulation, while safeguarding the interests of the public in all essentials, at the same time preserves to the companies control of their business policy and management, and, above all, that it allows full play and adequate reward to individual energy and initiative. For it is not reasonable to expect that men will put forth their best efforts in any business undertaking unless they are to have a share in the benefits resulting therefrom. Therefore, along with the reductions in rates that occur from time to time—due to economies of production or efficiency of administration—should go a general recognition of the right of the companies to some compensating advantage that will furnish an incentive for further effort in the same direction.

I think that when this view is fairly presented to the people, they will be quick to acknowledge the justice of it, as well as to see the benefit to them of such reciprocal conditions. There was a time when it seemed as if all corporations were about to come under the condemnation of public opinion, on account of certain unfortunate experiences in the past, which need not be gone into here. But, happily, this danger seems to be no longer imminent. We appear to be entering upon an era of better feeling, based upon better understanding, and a realization of the fact that our destinies are all bound up together.

Among the important factors that have contributed, and are contributing, to this result are such organizations as the National Commercial Gas Association. Concerted effort can accomplish much. From the ground already gained we draw encouragement to put forth still greater efforts in the future, knowing that the objects we seek are worthy the best that is in us. It should go without saying, however, that the work of our Association will succeed only as it is supported by the individual companies in its membership. The foundations must be laid by them.

To begin with, they must, of course, comply with all the requirements of law and valid regulations made in pursuance thereof; must furnish a product that will meet every proper test; and in the matter of service—which is perhaps the biggest word in our business—must be continually on the alert to improve and perfect it, for it is mainly through service that the good will of the public is secured and maintained—and good will is certainly one of the greatest assets of the utility corporation. The average citizen's opinion of such a corporation is based not upon its financial or administrative organization, however excellent these may be, but on his everyday experiences with those of its representatives with whom he comes in contact. If he finds that his complaints receive prompt and courteous attention, and that the company's employees take a real and intelligent interest in seeing that he is kept a pleased and satisfied customer, his impression of the corporation will be favourable; and the sum of these impressions is public opinion.

A company may comply fully with all legal requirements as to price, quality, and the like, and yet fail of the highest results solely through neglect of this vital question of service—or of what may be termed the human or personal element of the business as it affects its public relations. Success in this, as in other respects, is not to be attained easily or quickly—it must come through the slow process of building-up from firm foundations. When once attained, however, its value is beyond price. While the imperfections of human nature may not permit us to realize our ideal, still to the extent that we are able to approximate it we shall render genuine public service; and in doing so we shall immeasurably

strengthen the hands of the various organizations that represent the industry at large.

The general subjects the Association are to discuss are all of them important as well as timely; and this is particularly true of publicity. I believe most heartily in publicity and in advertising—in presenting in the most interesting and attractive way the public features of business. But I believe, also, that untold sums are wasted to-day in ill-advised efforts in this field. It is a field that is so inviting that many have drifted into it for the same reason that many have drifted into what I may call the field of efficiency development, because it furnishes employment that can be had in no other lines. Publicity of the right sort is essential to the maintenance and growth of every business undertaking; and advertising, as we understand the term, is one of its greatest elements. Ample publicity and liberal advertising—we all know their value; but to realize their full value we must study markets and conditions, and exercise sound judgment.

I think the men of business—certainly the wide-awake and observant among them—sense the timeliness of large questions of policy. If they keep abreast of the times they should feel the coming of discussion and agitation, and disclose that quality which is so essential to success in all walks of life—preparedness. If you develop this quality, you are not going to be caught napping. You are going to thresh out these questions among yourselves, so that if any of them become pressing you will have looked them over from every angle; you will have weighed the advantages and disadvantages; you will have estimated the profit and loss—in a word, you will have canvassed them thoroughly. Preparedness does not mean inaction. It is activity strengthened and buttressed by facts. On the other hand, we make some of our greatest blunders by mistaking motion for progress. Marking time is motion; but it does not get us anywhere. It may be good exercise, and it may keep us out of mischief for the time being; but we certainly would not adopt it as a symbol of progress. You do not mark time in this Association. You take your exercise in some other way. You make progress by the careful study of facts in each case; and therefore, when you move, you move in the right direction.

I am glad to avail myself of every proper opportunity to emphasize to organizations the necessity of simplicity in their scheme of operations—the application to their management of a variation of the old doctrine of plain living and high thinking. Nowadays we seem to delight in overloading them with a multitude of functions, because other organizations attempt to discharge such functions—just as we overload our houses with useless bric-a-brac having neither sentiment nor sense to excuse its presence, because somebody else has done the same foolish thing. Simplicity of management—a few things well done rather than many things indifferently done—that is efficiency of the only sort worthy of the name.

How well all this applies to educational work. The other day, when some of us were at the meter-repair shop in this city, I told the employees there assembled, and the boys from the trades schools who were present, of a distinguished foreigner who visited the United States Military Academy a year or two ago—a man of few words, who rarely submitted to an interview. He was followed around by eager and persistent gentlemen of the Press, who vainly tried to get an expression of his views. Finally, as he was boarding the steamer for home, he was asked his opinion of West Point, which he had seen in all its splendid efficiency. His reply—the only interview they secured from him—consisted of one word—"Thorough!" Could you wish for more if you sought an opinion as to your own educational work? Keep it "thorough." Keep it in simple and easily comprehended courses. Keep it practical as well as instructive. Quality is more important for you than quantity. One student well trained is worth a dozen with a smattering of knowledge.

In your treatment of the subjects that come before this conference, you will naturally be guided by these general considerations; will avail yourselves of all the information accessible to the companies comprising our membership; you will consult the experiences of companies engaged in other lines of business whose problems may have a bearing upon our own. Then, when all available facts have been gathered, they will be carefully arranged, studied, and digested. Thus your conclusions, when finally reached, will not only reflect credit upon yourselves, but will be of the utmost value to the great industry you represent.

## Gas Bye-Products in Japan.

According to the "Journal of the Imperial Gas Association of Japan," the Tokio Gas Company during the last six months of 1914 produced "refined gas bye-products, other than coke and coal tar" to the following extent:

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| Sulphate of ammonia | 749 tons. |
| Coal-tar pitch | 3,903 ,, |
| Naphthalene | 123,992 lbs. |
| Benzol | 69,667 ,, |
| Naphtha | 47,608 ,, |
| Cresin | 34,959 ,, |
| Creosote | 8,817,720 gallons. |
| Refined tar | 1,431,110 ,, |
| Light oil | 1,140,220 ,, |
| Carbon | 146,855 kin. |

During the same period, the Yokohama Municipal Gas-Works sold 28 tons of sulphate of ammonia, valued at 3692 yen.

# GAS AND WATER ENGINEERS OF AUSTRIA AND HUNGARY.

### Annual Meeting at Vienna.

The Thirty-Fourth Annual Meeting of the Association of Gas and Water Engineers of Austria and Hungary was held at Vienna on the 14th and 15th of May, under the Presidency of Professor H. Strache. The following account of the proceedings is taken from the official report published in the "Zeitschrift" of the Association, dated June 1.

This year's meeting should have been held at Aussig, according to the decision of last year's meeting; but after the outbreak of war it was decided to defer the visit to that town to a more favourable time, and to hold a meeting this year, without the customary excursions and festivities, in Vienna. The business programme was carried through in two days, and opportunity was merely given for members to meet together for social intercourse on three evenings.

The members assembled on Thursday evening, May 13, at the Kaiserhof Restaurant. In all, 95 members participated in the meeting. The technical proceedings were opened the following morning in the lecture hall of the Corporation gas undertaking. Dr. Strache took the chair and welcomed the members. He then called upon Herr Wenzel Vaigl, the Manager of the Pilsen Gas-Works, to read a paper on "The Future of the Gas Industry." This communication gave a study of the gas industry from the standpoint of national economy—emphasizing the advantages presented by gasification as a means of utilizing coal, and especially the hygienic value of gas as a heating agent. It dealt also with the importance of the bye-products of gas manufacture, and the neglect of instruction in the use of gas in technical schools and colleges.

In the discussion which followed the reading of this paper, Herr Menzel, of Vienna, proposed that a petition should be sent to the Minister of Education asking him to establish gas courses in the Austrian technical colleges. Professor Strache said the matter had already been considered by the Board of Professors at the Technical College at Vienna, and a petition from the Association would hasten a favourable decision. In his reply to the discussion, Herr Vaigl said that he had shown that gasification utilized coal to the best advantage, and that the use of gas for heating purposes ought to be enforced by law.

Herr Viktor Schön, the Deputy-Manager of the Budapest Gas-Works, then read a paper on the "Utilization of Coke Breeze," in which he recommended the manufacture of briquettes from coke breeze, and gave figures to show that breeze thus used gave better returns than when it was employed for firing boilers with the Wilton grate. Herr Anzböck produced drawings of the grate and gave an estimate of the economy which could be effected by its employment. Herr Teodorowicz referred to an expression of opinion that the Kudlicz grate superseded the Wilton, and pointed out that its construction and purpose were quite different. In replying to the remarks, Herr Schön stated that he could not recommend the use of coke breeze dust not exceeding $\frac{1}{8}$ inch in size for firing with the Wilton grate, as too much of the fuel was carried into the flues. But coke breeze not exceeding $\frac{2}{3}$ inch in size gave good results with this grate.

Herr Paul La Ruelle, of Vienna, next read a paper on the "Mundus Light." He explained its mode of working by the help of pictures thrown on the screen, and gave particulars of the consumption and lighting duty. He mentioned that the burner could be readily regulated to adapt itself to fluctuations in the pressure and specific gravity of the gas.

Herr A. Kaiser, the Chief Inspector of the Vienna Corporation gas undertaking, described the system of distribution employed in the supply of Vienna. Alterations had become necessary owing to the supply having been extended to the XII. to XIX. and the XXI. districts of the City and to some suburbs, which had earlier been supplied by the Imperial Continental Gas Association from four works situated at various points on the outskirts of Vienna. The position of the chief mains from the Association's former works had to be taken into account in reorganizing the distributing system, in order to secure proper conditions of pressure. The whole district has been divided into a number of distributing systems, to each of which the gas is delivered by high-pressure mains controlled by pressure regulators.

The reading of this paper concluded the morning's sitting; and after lunching together at the Rathauskeller, the members visited the Corporation electricity works at Simmering, and in the evening a number inspected the new gas-heating installation at the experimental gas-works.

On Saturday, the proceedings opened with the presentation of the report of the President on the past year and of the statement of accounts. The election of officers resulted in the choice as President for three years of Herr I. Bernauer, the Manager of the Budapest Gas-Works, and as Vice-Presidents of Herr C. Marischka, Works Manager at Vienna, for two years, and of Herr A. Swetz, a Water Engineer of Vienna, for three years. After announcing the results of the election of Officers and Council, the retiring President, Professor Strache, vacated the chair in favour of Herr Bernauer, the new President. It was decided that, subject to

ordinary conditions having been restored in the meantime, the meeting next year should be held at Aussig.

Dr. B. Biegeleisen then read a paper on the "Principles on which Sizes of Water-Mains are Calculated." After reviewing earlier formulæ, which in many instances gave widely discrepant results, the author explained a new formula which had been worked out by him in collaboration with Herr Bukowsky from the results of many observations, and advocated the graphic method of applying it. The next paper was by Herr J. M. Muchka, of Vienna, on "Modern Rapid Filters, especially those of the Bollmann Type." The latter is now in use in the buildings under the control of the War Office in Vienna, and has given good results. Herr E. Blumenau, of Gumpoldskirchen, then read a paper on "Modern Domestic Water Supply," in which he referred particularly to the "R.A.G." circulating pump, which possessed great advantages for the supply of separate buildings. He showed also a domestic pump, operated electrically, which automatically supplied one or more buildings in a simple and reliable manner from wells, or from mains in which the pressure was inadequate.

Herr Simon, of Bielitz, then advocated a commercial association of gas and water works, which would deal with the purchase of raw materials and stores, the sale of bye-products, fire and accident insurance, and benevolent funds. A long discussion took place on the matter; and it was decided that the Council should go into it (with Herr Simon) and report to the members.

In the afternoon about forty members of the Association went to inspect the Bollmann rapid filters and the ozonizing plant at the War Office. The party, with an addition to its numbers, proceeded to visit the work in progress for covering in a further portion of the Vienna river by an arched roof and a part of the Metropolitan Railway track near by. This work will result in a considerable area being made available for use as a market, and the liberation for building purposes of the site of an existing market. The greater part of the members who had attended the meeting spent the evening together at the Volksgarten Restaurant.

The report of the proceedings concludes with the remark that the meeting was a success, despite the fact that the war had reduced the attendance, especially of foreign members.

The papers read at the meeting are to be published shortly.

## BRIQUETTE MAKING AND TAR DISTILLING AT THE NUREMBERG GAS-WORKS.

The following is an abstract translation of a paper read by Herr Rudolf Terhaerst, the Manager of the Nuremberg Gas-Works, at a meeting at Bayreuth of the Bavarian Association of Gas and Water Engineers. The paper has been published in the "Journal für Gasbeleuchtung" for May 29.

The small return obtainable from the sale of coke breeze and retort pitch led the author to consider whether these products could not be utilized on the gas-works for the production of briquettes. Since, however, additional pitch would be required for briquetting the whole of the coke breeze, it seemed desirable to erect plant for the distillation of coal tar in order to obtain the necessary further quantity of pitch. The tar-still would serve also to provide oil for the naphthalene washers, and to re-distil the oil which had been used in these washers. It was also contemplated using some of the tar oil for the lubrication of the gas-exhausters, instead of costly rape oil.

Both the briquetting plant and the tar-still were erected in 1912, and have been in continuous work since then. The briquetting plant produces oval briquettes from small coke breeze with pitch as binding material. The coke breeze as produced is carried by the coke-conveyor into the storage tank of the briquetting plant. The hard pitch is broken to the size of nuts and then elevated to a centrifugal mill, which reduces it to an impalpable powder which falls into the pitch receiver. From the breeze tank and the pitch receiver a table strikes off uniform quantities of the breeze and pitch dust, which then pass through a conveyor worm and an elevator into the stirring apparatus. In this mixing takes place, while steam (superheated to about 200° C.) is admitted to bring the pitch to the proper binding consistency. The material thus prepared for the press passes over a delivery apparatus on to the receiving lips of rollers, which seize the material like toothed wheels, compress it, and deliver it in the shape of finished briquettes down a small trough into waggons. The strength of the briquettes depends chiefly on three factors—viz.: (1) the proportion of binding material; (2) the description or softness of the pitch used; and (3) the pressure (15 tons) which the outer edges of the two rollers exert on one another.

The proportion of pitch added cannot be varied much, because if it is too low the briquettes lack solidity or strength, and if it is too high they stick in the mould. The resistance of the briquettes to pressure in the direction of the small axis of the oval is tested by a very simple apparatus which has been devised on the gas-works. A piston working in a short cylinder is of such a size that, at 9 atmospheres, it exerts a pressure of 120 kilogrammes. The briquette resting on a plate is compressed by the piston. The cylinder is connected with the steam-pipe, so that only condensed water passes under the piston. When the steam valve is slowly opened, the pressure, read on a gauge, gradually rises until a small jerk shows that the briquette has been crushed. The briquettes stand, on the average, about 80 kilogrammes pressure. The wear and tear on the parts on which the coke slides and grinds is, of course, considerable; but it has been reduced by introducing screening plates and steel insets, which can be readily renewed. The cross rings on the rollers were at first much attacked; but they are now made by a special process, and over 2000 tons of briquettes have since been produced before new rings have been required.

The output capacity of the briquetting plant, which at the present time has only one roller press, is 25 to 30 tons per diem; but it could be doubled by introducing a second press. The briquettes contain on the average 8 per cent. of pitch. They do not break up in the fire, but burn like coke, and are suitable either for firing boilers or for domestic use. They are used not only on the gas-works, but in other corporation works, and they are sold readily to private consumers. They can also be used for water-gas manufacture; and the pitch then serves as a solid carburetting agent.

The cost of manufacture is comparatively low—viz., about 3s. per ton of briquettes, exclusive of the cost of materials. This allows of a much higher return from the coke breeze and the retort pitch than would be obtainable from them without briquetting. The briquettes now serve as fuel for the whole of the boilers on the works, and a considerable quantity remains over for sale. The coke breeze, if not briquetted, would not suffice by itself for firing the boilers. The boilers also produce more steam in a given time, and require less attendance, less cleaning, and produce less dust. The pitch required for making the briquettes is about double the quantity of retort pitch produced; the balance being obtained by the distillation of coal tar.

The tar-distilling plant has been erected in the sulphate-house, and after two years' use it has been decided to add a still by means of which the light oil can be worked up to benzol. Hitherto the plant has been worked merely to separate the tar into tar oils and hard pitch. The still is worked for this purpose to a temperature of 350° to 360° C.; the last part of the run being under a vacuum. The tar oils are collected in two grades—viz., the light oil up to 170° C., and the heavy oil up to 360° C. The dehydrated tar yields on the average 53 per cent. of pitch and 47 per cent. of oils. The latter consist of 10 per cent. of light oil, 52 per cent. of middle and heavy oil, and 38 per cent. of anthracene oil. The spent washing oil from the naphthalene washers is also re-distilled in the plant. The tar oil is used partly for fuel, partly for Diesel engines, and partly for washing gas and creosoting. It has so far been disposed of at satisfactory prices; an indirect effect of the use of the still being that the price obtainable for tar has improved.

## PROGRESS IN LARGE BLAST-FURNACE GAS-ENGINES.

At the recent annual meeting of the Iron and Steel Institute, Professor H. Hubert, of the Liége University, read a paper on "Recent Progress in the Design of Large Blast-Furnace Gas-Engines," with special reference to Belgian practice. The following are some extracts from it.

### The Need of Energy.

One of the most striking features of our epoch is the continually increasing need of energy. It compels the engineer constantly to devote himself to the more economical utilization of the energy available in coke-oven and blast-furnace gases, particularly in countries which, like Belgium, have had to contend with special difficulties arising, on the one hand, from the high cost of fuel, and, on the other, from the need of exporting the greater part of her products, and so competing with countries more highly favoured by Nature. The first stage in this process was the adoption of the bye-product recovery coke-oven, which enabled the valuable products formerly wasted to be obtained. These included: (1) Ammonia, which is required in ever-increasing quantities in the alkali and other industries; (2) benzol; and (3) tar, from which modern chemistry successfully extracts numerous very valuable substances.

The gases, being, in this way, deprived of valuable constituents which were, however, inconvenient for the production of energy, were more easily adapted for use in internal-combustion motors, the efficiency of which is nearly twice that of the system formed by a boiler and a steam-engine. Besides this, it became possible, by adding Siemens regenerators to the coke-ovens, to utilize the heat of the waste gases, which had been employed for the distillation of the coal in the ovens, to raise the fresh gases and the air itself to a higher temperature. By this means it is possible to devote to the production of motive power and to other uses a very much larger proportion of the gases evolved during the distillation of the coal.

### Genesis of the Gas-Motor.

While the invention of the gas-motor may be referred back to the commencement of the Nineteenth Century, and attributed to the French engineer Lebon d'Hambursin, it was not until 1860 that it emerged from the experimental stage. The first gas-engine to be practically and commercially applied was that of Lenoir. This engine, which was of the double-acting type, and in which

the explosive mixture was fired without previous compression, bears little resemblance to the present type of engine, and its thermal efficiency did not exceed 4 per cent. I should not have referred to this engine, which has so often been described in detail, were it not that I wish to point out that, contrary to the statements made in many works, Lenoir was a Belgian who was born at Mussy-la-Ville, near Virton, in 1822, and died in Paris in 1900. I may be forgiven for pointing out that, in addition to the important contributions which my fellow-countrymen have made to the development of the power of gas-engines and of their application in metallurgy, I cannot help feeling a certain amount of pride, particularly in existing circumstances, in placing on record the fact that it was to one of that little nation likewise that the inauguration of the era of the practical application of the internal combustion engine was due.

Though put together by the most skilful engineers of the period, the Lenoir engine did not realize the hopes of its inventor from the point of view of economy. As he did not adopt compression of the mixture before firing, his engine consumed far too much illuminating gas, which was the only gas then obtainable, and was very expensive. Further, it required a large amount of water and of oil, while it was unable to develop more than 3 H.P. In spite of these defects, some hundreds were made, and they performed such useful services in small industries that it was possible to foresee the successful future of the internal-combustion engine, while it served also to stimulate the endeavours of inventors to improve the yield and to increase the power.

Fifteen years had, however, to elapse before any further definite progress was made. It was not, indeed, until 1876 that the German engineer Otto invented the four-cycle engine, in which the explosive mixture underwent preliminary compression, though as far back as 1862 the French engineer Beau de Rochas pointed out with incontestable accuracy the method of working and the advantages that would be derived from the adoption of this type of engine. The views of this reformer were, however, neither understood nor carried out; and his memoir fell temporarily into oblivion, as had done before him the classic work of Sadi Carnot on the motive power of heat.

The "Beau de Rochas Otto" cycle opens a fresh phase in the history of the gas-engine. The thermal efficiency of this engine rapidly attained to 16 per cent.—thus exceeding that which the steam-engine was at this period capable of yielding. The new machine still, however, presented a good many imperfections from which the steam-engine was exempt. The gas-engine had, fortunately, a high thermal efficiency, and, above all, it possessed the advantage of being capable of being installed wherever illuminating gas was available, without having recourse to a boiler, which is cumbrous, dangerous, and necessitates the handling of coal and ashes. Thus it soon became a serious competitor of the steam-engine in the minor industries. It would have remained within these bounds, and even been limited to towns possessing gas-works, had not an English engineer, Mr. Emerson Dowson, succeeded in liberating the internal-combustion motor from this restriction by inventing the producer which he described at the York meeting of the British Association in 1878.

### Introduction of the Gas-Producer.

The gas-producer not only liberated the internal-combustion engine from the obligation of being installed in the neighbourhood of gas-works, but it also brought into practical use a much less expensive fuel capable of developing much greater power. The producer has, since its invention by Dowson, made considerable progress from various points of view. The introduction of the suction gas-producer has greatly simplified its construction, and rendered it a still more practical source for the production of motive power. This, however, has only within quite recent years exceeded 300 H.P., while on the other hand—and this is still its weak point—it can only use certain qualities of coal. Those which are too bituminous or too dusty are unsuitable for the production of the lean gases intended to supply gas-engines. Nowadays, however, thanks to Mond, it is possible to use in large plants fairly rich coals, by recovering, in the form of sulphate of ammonia, the nitrogen content in the fuel which in other systems is lost. It is thanks to this improvement that there has been successfully installed in Staffordshire the first central power-works for the production and distribution in bulk of lean gases. According to Mr. Herbert Humphrey, these works are distributing within an area of 25 square miles a considerable quantity of gas for the heating of furnaces and for other industrial uses, besides supplying motors and developing more than 20,000 H.P.

### Modern High-Power Gas-Engines.

The developments and improvements referred to have, however, only been made gradually; so that the progress of the gas-engine has at times out-distanced that of the producer, and been, so to speak, hampered by the latter. Up to 1889, it had not been possible to exceed 25 H.P. per cylinder. The important Deutz Company, founded by Otto, had not so far attempted to exceed this power in the 100-H.P. engine exhibited in that year at Paris, which had four cylinders. At the same exhibition a French engineer, then but little known—M. Edouard Delamare-Deboutteville—revealed himself as being fortunately much more adventurous. He had been, to begin with, engaged in road automobile construction. Having endeavoured to achieve his object by means of steam-carriages, he was naturally led to substitute for the steam-engine the internal-combustion engine, which dispenses with the use of a boiler. Aided by a skilful engineer—M. Malandin—he built an engine, based, like that of Otto, on the ideas of Beau de Rochas, but differing in many aspects from the Deutz engine. M. Delamare Deboutteville showed a sample of this engine at Paris in 1889, coupled with a Lencauchez producer, built by the Société de la Buire, near Lyons. This engine, like the Deutz, developed 100 H.P., but—and this is an exceedingly significant fact—it possessed but one cylinder, single-acting and working at four cycles. In spite of the contempt with which many engineers welcomed this plucky attempt—a contempt which I am glad to remember I did not share—and in spite of the difficulties strewn by powerful competitors across his path, M. Delamare-Deboutteville was not discouraged. He continued boldly to progress in the direction he had adopted, and in 1894 he succeeded in putting into operation, at the Pantin Mills, near Paris, a four-cycle mono-cylindrical engine, developing 220 H.P., with a speed of only 100 revolutions per minute.

The times were now ripe for the last stage of progress which it remains for us to consider—that is to say, the direct utilization of the gases from coke-ovens and from blast-furnaces in internal combustion motors. For a long time past, a number of engineers, like Lencauchez and Lürmann, had propounded the view that blast-furnaces were, as a matter of fact, large producers; but no one, prior to the stage to which reference has been made, had dared to think of using these exceedingly poor and dusty gases in so delicate an appliance as the gas-engine. When an idea has ripened, when the environment becomes favourable to its development, it frequently bears fruit simultaneously in many minds; and this is what once again now occurred. It was the late Mr. B. H. Thwaite who made the first experiments, in 1894, at the Glasgow Iron-Works. This interesting attempt, which was not, however, followed up in Great Britain, does not appear to have been known to Continental metallurgists. It is, in any case, extremely remarkable that a short time afterwards experiments of the same nature were made independently of one another at Seraing in Belgium, and at Hoerde in Germany. Belgium played in the practical development of this new application an exceedingly remarkable, if not preponderating, part. It was, as a matter of fact, the Cockerill Company at Seraing who ventured to build, in 1897, the first large blast-furnace gas-engine, developing 200 H.P. This undertaking was decided upon after experiments carried out on a small 8 H.P. engine, in which I myself took part with M. Bailly, and with which I dealt, in 1897, in the paper published in the "Annales des Mines de Belgique," where the question was first scientifically discussed with a clear appreciation of its future.

It was your President, M. Adolphe Greiner, who, foreseeing a future awaiting the fresh application of blast-furnace gas, decided, on the suggestion of two of his engineers (MM. A. Bailly and F. Kraft de la Saulx) to build the 200 H.P. engine of which I have spoken. For this he appealed to M. Delamare-Deboutteville for collaboration, and soon after, on April 11, 1898, this engine was put into operation and subjected to severe tests, during which Professor Aimé Witz and I ascertained that the gas consumption per horse power per hour was only 3·329 cubic metres, the calorific power being 981 calories per cubic metre. It was upon these results, which assigned to the gas-engine an efficiency of 20 per cent., and showed incontestably the enormous amount of energy which could be rendered available by its means, that M. Greiner decided to build the well-known single-cylinder four-cycle 600 H.P. engine that was so marked a feature at the Paris Exhibition of 1900, and gained for the Cockerill Company the Grand Prize, which was the highest of the awards available.

At a period when the writers of a certain other nation are unjustly challenging the part played by Belgium in the direct utilization of gas-furnaces, it is well to repeat the facts I have referred to. Although the Hoerde Works carried out tests on the same lines shortly after those of the Cockerill Company, and put into operation a two-cycle Oechelhaeuser engine of 120 H.P. in 1896, and two years later a 600 H.P. engine of the same type but with two cylinders, the Deutz Company had built for the Paris Exhibition in 1900 a 500 H.P. engine which preserved the four-cyclinder type, so that in reality each of the cylinders only developed 125 H.P. For a long time the Deutz Company only followed the bold designers of the Cockerill Company from afar. Their manager even maintained, in the columns of the Technical Press, that it was not reasonable to expect to exceed 350 H.P. in a single-acting four-cycle cylinder. [The author proceeded to describe in detail, with the aid of diagrams and photographs, the latest improvements introduced by the Cockerill Company in the construction of large horizontal gas-engines.]

I will conclude this description by giving the principal dimensions of the different models from which the latest types of the Cockerill Company's engines are built:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Effective horse power— | | | | | | | | |
| Two cylinders . . . . | 960 | 1250 | 1600 | 2030 | 2400 | 2825 | 3400 | 3200 |
| Four ,, . . . . . | 2000 | 2500 | 3300 | 4130 | 5000 | 5650 | 7000 | 8000 |
| Average number of revolutions per minute . . | 115 | 107 | 107 | 100 | 100 | 94 | 91 | 90 |
| Diameter of pistons— | | | | | | | | |
| In millimetres . . . . | 700 | 800 | 900 | 1000 | 1100 | 1200 | 1300 | 1400 |
| In inches. . . . . | 27·6 | 31·5 | 35·4 | 39·4 | 43·3 | 47·2 | 51·1 | 55·1 |
| Stroke of pistons— | | | | | | | | |
| In millimetres . . . . | 1200 | 1300 | 1300 | 1400 | 1400 | 1500 | 1500 | 1600 |
| In inches. . . . . | 47·2 | 51·1 | 51·1 | 55·1 | 55·1 | 59·0 | 59·0 | 63·0 |

It was the last type but one, of 7000 effective horse power, that the Cockerill Company installed in 1914 in their large central power

house. This engine, which is probably the most powerful gas-engine in the world, weighs, without connections and the electric dynamo, 750 tons, or about 109 kilos. per effective horse power. The gas consumption guaranteed by the Company for this type of motor corresponds to 7580 B.Th.U. (1910 calories) per indicated horse-power-hour, and to 8530 B.Th.U. (2150 calories) per effective horse-power-hour. The mechanical efficiency is about 89 per cent. The consumptions of water for cooling and of oil for lubrication are respectively 50 litres (11 gallons) and 1·1 gramme (17 grains) per effective horse-power-hour. It is interesting to note that in the earlier experiments carried out by M. Witz and myself on the 200 H.P. engine, the gas consumption rose to 3260 calories, the consumption of water to 100 litres, and that of oil to 18 grammes, per effective horse-power-hour. The 600 H.P. engine of the year 1900 weighed 127 tons, of which 33 tons belonged to the fly-wheel. This gives to the engine itself a weight corresponding to 210 kilos. per horse power. These figures enable us to estimate the progress made, both in regard to the power of the engines and in economy of construction and working.

### Progress in England and Elsewhere.

Having thus described the progress and development of large gas-engines on the Continent, it would be not uninteresting briefly to refer to what has been done elsewhere. After hesitating to follow European engineering practice, some American engineers boldly entered the field and have attained, both as regards numbers and power of their engines, an honourable position. It is therefore not without some surprise that we see Great Britain, which was the first country to use blast-furnace gas direct, and which possesses numerous highly skilled engineers, hesitating to embark on this industry. If part of this hesitancy be ascribed to the conservatism of the British race, it is probably no less true that the low cost of fuel, which enables metallurgists to produce metal cheaply, partially explains this indifference as well. Several large firms have nevertheless taken up the manufacture of Continental types of engines, for which they have acquired licences, and have in some instances introduced interesting modifications. Though large and powerful two-cycle engines are still being built, it would appear that the advantages remain with four-cycle double-acting engines, arranged in single or in double tandem. The eminent British engineer, Mr. Dugald Clerk, who certainly cannot be taxed with partiality, seeing that he is to a certain extent the father of the two-cycle engine, points out, not without surprise, in his treatise published in 1913, that two-cycle engines are somewhat heavier than four-cycle double-acting engines.

Reference should, however, be made to an original and interesting attempt to solve the problem of the building of large gas-engines on lines other than those followed by Continental engineers. I refer to the vertical multi-cylinder high-speed engines built more especially by the British Westinghouse and the National Gas-Engine Companies. These engines are composed of units compounded together, and comprising each two vertical single-acting four-cycle cylinders, the pistons of which are mounted on the same rod. Each of the units drives a crank of the engine-shaft. The development of power is obtained by increasing the number of units, each of which usually develops 250 H.P. The National Gas-Engine Company have attained, by this system, an output of 1500 H.P. by employing six units and, consequently, twelve cylinders. These engines make from 200 to 300 revolutions per minute. According to Mr. Dugald Clerk, the weight per effective horse power of these engines is only about one-half that of large horizontal double-acting two-cylinder tandem engines. They thus constitute serious competitors of the latter, so long as the power does not exceed 2000 H.P., as this would need twelve 26-inch cylinders, and the complication would be extreme.

So far as the iron and steel industries are concerned, it is interesting to recall that the high rate of revolution of these vertical engines allows of their being used to drive rotary blowing-engines (turbo-blowers) direct, and thus to form powerful and exceedingly compact groups. I may mention an interesting attempt of this description which was made by Mr. Hill on the furnaces of the Midland Coal, Coke, and Iron Company, near Newcastle-under-Lyme. A vertical engine of 375 kilowatts, comprising three sets of two cylinders, built by the National Gas-Engine Company, drives direct a rotary blowing-engine, developing a pressure of 6 to 8 lbs. per square inch.

### Utilization of Blast-Furnace Gas.

Another point of interest to note, as regards the application of blast-furnace gases in large engines, is that of the cleaning of the gases. The presence of a high percentage of dust was, in the early stages, an exceedingly serious drawback, which appeared for a time to be insurmountable. At the present day, however, the problem has been completely solved. The use of scrubbers of different systems, of centrifugal fans, of water injection, and, in particular of the Theisen apparatus, has for some time past allowed of the proportion of dust in the gas being reduced to 0·005 gramme per cubic metre. I should not have had to allude to this subject had I not wished to refer to a remarkable attempt to supply an alternative solution to the problem of the purification of the gas, which may, in some instances, prove exceedingly useful. I refer to dry cleaning by the Halberg-Beth process. The British High Power Company, Limited, who constructed this cleaner, have installed one at the works at Newcastle-under-Lyme already mentioned. The plant, which is capable of cleaning 200,000 cubic feet of gas per hour, only occupies an area of 550 square feet, and the power requirement is only some 20 H.P. According to Mr. Hill's estimates, the cost of purification only amounts to £10 weekly. The method is limited to cases in which the gas does not contain any condensable tar. This is just the condition with which blast-furnace gases comply; and we may justly expect to find that dry cleaning will render valuable services to the iron and steel industries in many instances.

In conclusion, I have only to refer to the most recent improvement which has been introduced as regards the economic utilization of blast-furnace gases. It has been in use for some little time at several Belgian and British works. In spite of the intense cold obtained by the circulation of cold water in the casing of the cylinder, in the piston and its rod, and in the exhaust valves, the gases emerge from the cylinder at a high temperature, which attains, and sometimes even exceeds, 500° C. (930° Fahr.). If the specific heat of this gas be taken at about ·25, and the horse-power consumption at 2·2 cubic metres of gas, requiring for its further combustion 1·80 cubic metres of air, the amount of heat which is carried off in the escaping gases may be estimated at 650 calories (2600 B.Th.U.) per horse-power-hour. I think about three years ago this heat was entirely wasted. The plant consists of the addition to the engines of boilers each comprising a horizontal tubular boiler surmounted by a vertical economizer, likewise tubular. The gas, on leaving the engine at 230° C., enters the boiler, and is reduced in the economizer to 110° C., while the water is heated-up from 8° C. to 170° C. The water finally passes into the boiler, where it is converted into steam at a pressure of 8 atmospheres (114 lbs. per square inch).

At the present moment, four similar boilers have already been installed by the Cockerill Company for the utilization of the heat of the gases escaped from four engines, developing an aggregate of 5000 B.H.P. Steam is raised in the proportion of 0·875 kilo. (1·93 lbs.) per electrical horse power of the engine, and supplies a turbine, developing about 650 H.P. These boilers recover 55 per cent. of the heat of the gases, and increase the thermal efficiency of the engines by about 13 per cent. These figures have been supplied by M. Léon Greiner, in a paper read by him before the Association des Ingénieurs de Liége. The author calculates that, with an installation of four blast-furnace gas-engines, developing 10,000 H.P., and costing about £76,000, the expense of installing these recovery appliances (boilers and turbine) would be £9200. Allowing that interest and annual redemption of capital should be taken at 13 per cent., and assuming £400 as the annual cost for wages and maintenance, he has shown that the saving effected by recovery would amount to about £3880 per annum. If we assume that a thermal efficiency of 30 per cent. can be obtained in the gas-engine without difficulty, we find that the latest improvement which has just been described raises this efficiency to 35 per cent.—that is to say, just double that of a group consisting of high-class boilers and high-class steam-engines.

Can any further progress be made? Let us consider the question, as discussed in the latest and most important text-book by an engineer who has very greatly contributed to the progress of the internal-combustion motor, Mr. Dugald Clerk. He enunciates the view that it will be possible to extend the total efficiency to within the neighbourhood of 50 per cent. by raising the average pressure, which at the present day cannot, without occasioning inconveniences, exceed 70 lbs. per square inch, to 95 or 100 lbs. per square inch, by the method of super-compressing the escaped gases. He notes likewise the possibility of considerably reducing the heat losses in the wals, and cites in this connection the experiments by Professor Hopkinson, of Cambridge. By means of carefully injecting water into the cylinder during the compression, he succeeded in rendering unnecessary the circulation of cold water in the cylinder and the piston, and he therefore obviated difficulties and inconveniences in the construction and working of large gas-engines.

All these improvements, and possibly others, such as the use of the combustion turbine, will be the tasks of the morrow. One of them I may, however, refer to as having already been realized. In most of the existing blast-furnaces, even where the improvements described have been introduced, part of the energy contained in the gases is still wasted. On Sundays and during holidays, and sometimes even on ordinary week nights, the works associated with blast-furnaces and coke-ovens, which ordinarily consume the energy obtained by the utilization of the gases, either are not working or require but a small proportion of the energy available. It is therefore necessary to cease its production, and allow the gases to escape partly into the atmosphere, as was formerly done. During this period steam-engines work in the central power stations, and supply current to certain works and to the tramways and electrical railways, producing energy at a greatly increased cost. To avoid this waste, district power centres are being linked-up. Such an installation already exists in Durham and Northumberland, and distributes over an area of 1370 square miles the energy being produced from 31 steam-engines, developing 11,600 H.P., and 23 engines using the waste gases from coke-ovens and blast-furnaces, and developing 46,760 H.P., making an aggregate of 162,760 H.P. A similar power area has been established in Westphalia, developing an aggregate of 200,000 kilowatts. Only the outbreak of the war prevented the installation in the province of Liége of a similar system, developing 83,200 kilowatts. The future will see more and more of these developments, which are so valuable from the point of view of the most economical utilization possible of the power formerly lost; and it is not without some little pride and some little emotion that I quote the noble motto of my beloved country: "Union is Strength."

# HYDRO-GEOLOGICAL CONDITIONS AT NEWBALD, EAST YORKSHIRE.

By Percy Griffith, M.Inst.C.E., F.G.S.

**Extracts from a Paper read at the Meeting of the Institution of Water Engineers.]**

The purpose of this memoir is to explain the somewhat peculiar geological conditions of the district around Newbald—that is, at the escarpment of the chalk forming the East Yorkshire Wolds—so far as they affect the question of water supply. The investigations described were carried out for the purpose of obtaining a suitable source for the water supply of the rural district of Howden. This district comprises an area of about 150 square miles, sparsely populated; the only town included in the district being Howden, with a population of 2000. The remaining inhabitants (numbering about 10,000) are distributed among widely scattered villages.

Appointed at the end of the year 1911 to advise the Council upon the question, the author has since been engaged in preliminary investigations; and in March last was able to prove by exhaustive tests the existence of an ample supply of excellent water at a point about a mile south of North Newbald. Within the district of the Howden Council is an area of 3 square miles of the chalk "wolds," immediately adjacent to which are two large springs (known as the "Drewton" and "Weedley" springs), which form the source of a stream known as "Drewton Beck." The fact that such an excellent supply of water existed on the border of the Council's area did not, however, go far towards making the supply available for the general use of the inhabitants—indeed, the earliest steps taken towards this end brought to light difficulties which proved practically insurmountable. It was found that the use of the spring for a public water-works would be strenuously opposed by the riparian owners and others; and that to secure the necessary authority to do this, the Howden Council would have to obtain a Special Act. A Provisional Order, under the Public Health Act, 1875, would have sufficed for the compulsory purchase of land, but not for the purchase of water rights. At this juncture it was realized that a rural district council has no statutory authority to promote a Private Bill, and that, in the event of such a Bill failing to pass into law, the members would be liable to be surcharged with the expenditure incurred, subject to the discretion of the Local Government Board to remit the surcharge if they thought fit.

The author then considered other possible sources, in the first place with a view of intercepting the water overflowing at the Drewton and Weedley springs at some point underground where the riparian owners would have had no claim for protection. It should be explained that the clay underlying the chalk, which forms the overflow for the chalk water, outcrops at a fairly constant level of 175 above O.D., and that consequently, if a sufficient supply could be tapped at any point along this outcrop, it would flow to the inhabited part of the Howden district by gravitation. The idea of collecting a supply by means of adits driven into the hillside was considered, but abandoned on the ground that the outlay on purely experimental work would have been at least £4000 or £5000, and that it was, indeed, impossible to estimate the actual expenditure necessary to secure the full quantity required (167,000 gallons per day). At this stage the author, in making calculations as to the diameter of the mains which would be necessary under various heads, found that, owing to the great distance between the source of supply and the various villages to be supplied, the raising of the water to an extra height of 100 feet—viz., 275 feet above O.D.—would so reduce the cost of the mains as to more than cover the cost of pumping the water. As this alternative opened out a much larger area in which a suitable source could be sought for, and admitted the possibility of obtaining the water from underground by means of a well or boring, the author carefully examined the area north and south of the Drewton and Weedley springs with such an alternative in his mind. In this way he was led to devote his attention to the neighbourhood of Newbald, situated about two miles north of these springs.

At a point east of the village, where the denudation of the chalk has thrown the outcrop of the underlying clay about half a mile east of the normal line, are powerful springs draining the chalk, which form a stream known as Newbald Beck. This stream, after passing west and south-west through the village, turns south for about a mile, then south-west through another village (within the Howden district), and thence southwards until it joins the Drewton Beck. About 200 yards below the point where the stream turns to the south, it is joined by a small tributary which rises at a spring situated in another valley, similar to the main valley, but which curves sharply to the south-east about half a mile east of the church. This valley is very deeply cut into the chalk wolds, and extends for a distance of a mile from the point where it bends to the south-east. It is entirely free from dwelling-houses; and calculations from rainfall records showed that the drainage of this valley should provide an ample supply for the Howden district. The stream formed by the spring at the mouth of the valley also showed an ample discharge when first measured; and the author felt every confidence in making a trial boring on the centre-line of the valley at such a distance from the spring as to preclude any risk of claims from riparian owners. The boring, however, beyond showing the saturation level in the chalk, the thickness of the chalk, and the existence of a well-defined band of "Red chalk" at its base, proved a complete failure as regards yield of water.

The next step taken was to sink a well to the base of the chalk at a point half a mile further down the valley; and from this headings were driven across the centre-line of the valley with a view to intercepting the underground stream which was assumed to be draining the valley towards the spring. A supply amounting to about 4000 gallons per hour was obtained by this means; but as this was inadequate, and likely to decrease after continuous pumping, it was necessary to consider whether a sufficient supply could be obtained from any one point on the chalk outcrop.

The failure of this well, sunk on the centre-line of a deeply cut chalk valley, proved beyond possibility of doubt that, contrary to generally accepted theory and experience in other chalk areas, the underground drainage or stream lines did not in this case follow the surface configuration. A boring was driven from the bottom of the well to ascertain the sequence of strata underlying the chalk; but unfortunately the yield of water was not materially increased. For financial reasons, the author could not advise the Council to continue the experimental work at this site. It was afterwards proved that if the boring had been continued for a further 10 feet, it would have reached the Oolitic limestone, and possibly tapped a sufficient supply of water therein. But no evidence of this was then available; and the results since obtained elsewhere have entirely justified the decision arrived at.

On the banks of the Newbald Beck, the author had observed some very strong springs flowing into it at a point situated about half-way along the stretch which travelled southwards. These proved on examination to have been piped with earthenware drains (in the form of an inverted U laid on flat tiles), extending for a distance of 140 yards across a field. Excavations at this point revealed three springs at a depth of about 3 feet below the surface, and a trial boring immediately to the east of the springs disclosed further that the water rose through vertical fissures from a depth of 12 feet below the surface where the Oolitic limestone was touched. The problem as to the real source of this large flow (rough measurements showed it to amount to about 400,000 gallons per day from the three springs, or nearly one-half the flow of the beck at that date) became therefore extremely interesting. A further study of the geological maps, sections, and memoirs revealed the fact that the beds between the chalk and the limestone were arched on a north to south plane, and that at a point about a mile north of the village the clays separating the chalk from the limestone disappeared. At this point a characteristic chalk valley extends eastwards into the wolds, distinguished by an entire absence of springs or stream. It then became evident that, at the base of the valley, erosion had removed the clay and impervious band of "Red chalk" separating the two water-bearing strata, and thus enabled the natural drainage of the local chalk area to pass into the freely fissured limestone, and, following the dip, to pass southwards until, at a point where the erosion caused by the Newbald Beck or its earlier prototype had rendered the overlying beds insufficient to resist the upward pressure due to the head, the water had burst open an outlet for itself, whence it flowed into the beck.

A small trial boring was then driven at a point 200 yards to the east of the Oolite springs; and subsequently a contract was entered into for a 12-inch boring to be driven into the Oolitic limestone, and for test pumping therefrom. The boring was so successful that three weeks' continuous pumping at a rate of 10,000 gallons per hour made no impression whatever on the water level. On analyzing the water, however, signs of pollution were found; and a period of three months was occupied in tracing and removing the cause of this pollution, and in again testing the 12-inch boring. The final test proved perfectly satisfactory; and the scheme will be proceeded with as soon as the war is over, and financial conditions become more nearly normal.

## DISCUSSION.

The President (Mr. F. W. M'Cullough, of Belfast) expressed, in the name of the members, their obligation to Mr. Griffith for his paper.

Mr. C. B. Newton (Hull) said the question of water supply along the escarpment of the chalk of the Yorkshire Wolds was one of extraordinary difficulty. It was found that wherever great masses of chalk rested upon clay beds, as in the Newbald area, the pressure of the weight of chalk on the clay resulted in the latter being squeezed out, or made into irregular beds, and the chalk strata also were turned upwards and outwards as the clay branch was thrust forward. In addition to these difficulties, there was an anticline in the central part of the Wold; and upon its slopes the new deposits thinned-out in a feathered edge. In one small quarry not far from Newbald were beds of lias, upon which directly rested the red chalk, and upon this again the white chalk; all this occurring within a depth of a few feet. In fact, ordinary geological conditions of water supply could hardly be said to obtain in this area. He thought that Mr. Griffith was to be congratulated upon his happy solution of the difficulties of obtaining a water supply for the district.

Mr. W. Whitaker, F.R.S., F.G.S., thought the paper illustrated what most of the members had before them occasionally—that was, the difficulty in regard to providing small water supplies. As a rule, there was no difficulty if a town wanted 2 or 3 million gallons of water a day; it could be got. But when a water supply was required for a rural district, the trouble came in—the local council

could not afford to expend £2000 on experiments, as in the case of a large authority. The paper illustrated how objectionable at times were the ways of Nature, as when one came to a place where theoretically no one would doubt he would get water, and proceeded to make a borehole, it was sometimes found that Nature had chosen to send the water another way. It was the water engineer who had to deal with these difficulties; and it was a great thing that comparative failures should be recorded. His own impression was that they learned more from the failures of others than from their own failures or successes. Those who did not get success with a scheme should record it—a want of success showed that there must be perseverance.

Mr. H. PRESTON (Grantham) thought they ought to feel very grateful to Mr. Griffith for having given them a clear description of a most interesting investigation, and one which showed the advantage of having some general idea of what they might expect, and of possessing the power to investigate any variation from the expectation. As to underground streams, he had himself on various occasions discovered that, when he expected to find water flowing (say) to the west from the escarpment, he found it flowing at right angles—sometimes in a northerly and sometimes in a southerly direction. This was often due to the fault of the lower strata of clay, as spoken of by Mr. Newton. He supposed the boring described by the author was stopped just when it got well into the Kellaways Rock. It seemed a pity, when a boring was put down into pervious rock, that it should be stopped until all was known that the boring could teach them. It was advisable on every occasion, where it was possible, to continue the boring until they got to impervious strata, because until this was done, it could not be said that the boring was a failure. It was possible that, had Mr. Griffith gone on a few feet farther, he would have got into the Oolites, and would have obtained his water. The 12-inch boring into the Oolites appeared to him (Mr. Preston) to be something like 200 yards from the Newbald Beck; and when pumping the author found a large quantity of water there. He (Mr. Preston) wondered whether it was possible that water from the Newbald Beck was getting into these Oolites, and so keeping the boring well supplied with water.

Mr. A. B. E. BLACKBURN (Sunderland) heartily congratulated Mr. Griffith on bringing forward this paper at the early stages of the scheme, because it was then that a solving of difficulties arose—the actual construction of the works which followed did not present any great difficulty. It was the difficulty of finding water for small places that was so interesting; and the expert ought to be thankful for having papers of this character read. It was an easy matter for members to bring forward particulars of large schemes; but such schemes were limited in number.

Mr. GRIFFITH, in reply, said he was very grateful indeed for the reception given to the paper, and especially for the kind words used by Mr. Whitaker. He (Mr. Griffith) had, more than once, in spite of criticism, made a special point of bringing before the Institution the difficulties he had met with in connection with schemes—whether the difficulties were overcome or not. He felt, as a matter of principle, it was their duty to one another to share their difficulties as well as their successes. Mr. Preston naturally asked the circumstances under which the boring was stopped when so near an apparent and possible success. The answer was given in the paper. The reasons were mainly financial ones. As Mr. Whitaker had said, when dealing with these small councils, an engineer had to go very "gingerly" at every stage of the work. He was not given *carte blanche*, and told to spend £5000, and then say what had been done for the money. If in these small schemes one got £100 for experimental works, one had to think himself lucky; and if one could get another £50, one had to think himself additionally lucky. Rather more than this had been spent on these works; but it had been uphill work to get the money to carry out experiments on a proper basis. He was anxious to continue the boring; but he was then slightly beyond the limit of expenditure allowed him. He went round another way—it was a longer way, possibly; but he got a better result. He was not sure in his own mind that a water supply from the Oolites would have been better than from the spring. He was not at all certain as to whether the fissures in the limestone were so uniform throughout the bulk, and especially down the dip eastward, as they were near the broken outcrop; and he should feel that a casual boring sunk inland from the outcrop might possibly miss the larger fissures, and might prove comparatively sterile. Moreover, as he had pointed out, the essential feature of the supply they discovered was that it was travelling altogether in a different direction from that of the dip—it was travelling north to south. He believed that the bulk of the flow reached the Humber direct underground; and the large springs were merely overflows from it. In this event, an interesting feature was obvious—that was, that the area of chalk drained into this underground stream was very large, and not by any means a local area. There they had, he thought, an interesting example of what Mr. Preston referred to—that was, as to finding, when boring, water travelling in a reverse direction from what was expected. Regarding the question as to whether the beck got into the Oolite, it must have been the other way about. The pressure of the underground water must have been higher than that of the beck; and therefore the underground water would have got into the beck, instead of the beck water into the Oolite. There was no doubt this underground water was the drainage of an area some distance away. The fact of discovering an independent supply from a larger gathering-ground was extremely fortunate.

# CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

## Domestic Coal Supply.

SIR,—The Government proposals that local authorities should be empowered to purchase a supply of, and to retail, coal for domestic consumption, is one that is likely to mature; and where such local authorities are also in possession of a gas undertaking, it is reasonable to assume that this duty will be discharged by the gas authorities.

Much could be urged in favour of such a proposal—not only as a temporary expedient, but as a permanent provision.

There are but few gas undertakings at the present day that are not required to break-down the larger coal received in the bulk to a size suitable for the varying mechanical devices to effectively handle; and, by a simple addition to the present appliances, arrangements could be made whereby the "round" coal could be set aside for retail sale, instead of being, as now, broken down in the bulk.

If such a provision is sound for local authorities, it will also be sound where a gas undertaking is in the hands of a private company; as, under the sliding-scale, the interests of the consumers and shareholders are largely interwoven. And, moreover, the price at which large buyers, such as gas undertakings, procure their annual supplies, would enable them to make a fair profit, and still retail the coal at a price considerably less than normally prevails.

They are already equipped with a department dealing with the sale of fuel in large quantities; and their organization would require but little expanding to deal with the new branch of trade.

It is a fact that where statutory powers have been sought to indulge in this business, they have invariably been refused. But we are living in different times now; and the present seems opportune to press what can be urged as legitimate claims on the part of such undertakings to merely extend their present business to its logical conclusion.

In all probability, if joint action were taken, such a proposal would be received favourably; and I venture to ventilate the subject with a view to its having due consideration.

W. R. HERRING.

*Palace Chambers, Westminster, S.W.,*
*June 25, 1915.*

## A Novel Preferential Rate.

SIR,—A good deal has been written and said for and against the expediency and justifiability of charging preferential rates for gas—*i.e.*, the sorting into classes of the uses to which gas supply is put, and charging the users rates varying according to the cost of production, &c., of the gas so used.

The course of study which is necessary in order to arrive at the rates which would be just to all classes of consumers—those who come under the maximum as well as those who benefit directly by the minimum rates—is an interesting one; and often when the outcome of his studies is put into practice it brings disappointment to the student, for so frequently the main result attained is to make him of the maximum class think the minimum charged class is benefiting at his expense.

Consumers as a body cannot appreciate, nor is it reasonable to expect that they should do so, the subtleties of the arguments generally employed, and the complexity of the calculations necessarily involved, in the course of such a pursuit. They do not like puzzles of this kind, but greatly prefer "to have the goods marked in plain figures."

My experience of preferential prices dates from the time the Enfield Gas Company first embarked on the hiring-out of gas-cookers, when, to help the business to run (for it was harder in those days of gas at 5s. per 1000 cubic feet than it is at the present time, to get new departures taken up by the gas consumers), the Directors created a preferential rate, under which the user of a gas-cooker of a certain prescribed make and minimum size became entitled to be charged, for all the gas he used (irrespective of the purpose for which he used it), at a rate 3d. per 1000 feet less than was charged to the consumer who did his cooking by non gas means.

No doubt many would designate such an arrangement as unscientific in conception and construction; but, unscientific or not, it at any rate obviated the use of separate meters for lighting and cooking, and appealed to the public so strongly that it was retained in the Company's system from the day it was instituted until that on which the Enfield Gas Company ceased to exist.

There were, of those interested in the Company, some who thought the preference would lead to a few of the consumers paying the hiring rent simply to pass as cooker users without actually being such, and so unwarrantably obtaining the benefit of the lower price. Watchful eyes were, therefore, kept upon all cases of a character likely to engender suspicion. But experience has fully borne out the original confidence felt that a good cooker, well maintained, is too great a convenience to remain unused in a house, while the fact that the average quantity of gas supplied annually to the users in the preferential class was more by 21,000 feet than was taken by the average of the other or ordinary class in the like period, completely disposes of the objection.

In passing, I may mention that the comparative quantities supplied annually to the two classes was 31,000 cubic feet to the ordinary and 52,000 cubic feet to the preferential class; and that neither class includes institutions, factories, and such-like large users, but only the rank and file of householders, pure and simple.

We gave away then, 3d. × 52 = 13s. per preferential user per year; and in return for this secured from each of them an extra annual business of 21,000 cubic feet As this quantity was produced at Enfield by strictly marginal plant, the cost in connection amounted to only a small proportion of the sum of the total net cost of coal and working expenses, per 1000 cubic feet.

That the policy I have referred to did encourage the use of gas-cookers to quite a large extent, I am fully satisfied; for whereas in the old days the gas sent out during a summer Sunday of twenty-four

hours, ending at 6 a.m. on the Monday morning following was only about 18½ per cent. of the year's maximum daily output, in 1913 it reached nearly 51½ per cent. of the then relative figure.

Perhaps some of my friends who have reason to know that because of their high selling price, the bulk of the consumers they have to serve do not consider a gas cooker essential to their householders, may find the experience I have related of some use to them, and of benefit to the undertakings they represent.

CHARLES W. OFFORD.

*Tottenham, June 25, 1915.*

## Recklessness at Glasgow.

SIR,—Will you allow me, through the medium of your columns, to offer to the Glasgow Gas Committee my heartiest congratulations on the staff rearrangements they have made, whereby they have effected an annual saving in salaries of one-forty-third of a penny per thousand cubic feet of gas sold, by placing upon the Engineer and General Manager (among other things) the highly important and brain-consuming task of signing thousands of cheques? I think, too, that the new Cashier and the Superintendent of the late Treasurer's general staff should be included in my felicitations, on account of the handsome salaries they are to receive—£300 and £370 per annum respectively.

Surely, this must constitute a record! In these days, when we are all asked to economize in our expenditure, Glasgow should not have set this awful example of recklessness!

SOUTHERNER.

*June 26, 1915.*

## Is the Institution of Gas Engineers a Failure?

SIR,—Mr. MacLeod has launched his trenchant article at a most opportune time. Last year our attention was largely occupied with pages in the Daily Press on "Is the Church a Failure?" and other burning questions. The war has banished such fruitful topics therein. Now we have got one of our own; and the Technical Press should form an airing-ground for many fluttering pens, hitherto restrained, on such an issue as above. May I append a few stray thoughts?

If we have got to depend on the judgment of "the man in the street" as to the worth that is in us, then central building or no central building, examination qualification or no examination qualification, I would say our case is presently well-nigh hopeless; and we must continue to dispense light and heat, and remain blushing in the shadows. From an engineering point of view, to the many, our works must stand as the one evidence of ability as engineers. Into the finesse of distribution, &c., they do not, and you cannot expect them to, enter. And the necessities of manufacture generally mean that works are consigned to the handiest "No Man's Land." "Oh! that's the gas-works." Such a remark generally has the ring about it as if such a place were a nuisance rather than a blessing to civilization. Weird processes and weirder smells alone are generally associated with such a centre of activity in the mind, and one might add nose, of "the man in the street."

But I do not see how the Institution of Gas Engineers or a central building in London can affect the case. Like chemists, the gas engineer might display a certificate at the gate of the works that he is duly qualified to dispense such a medium; but I doubt if it would inspire increased estimation. The manufacture of glue is a wonderful and elaborate process; but what examination and what institution is going to elevate the unfortunate manufacturer of such a useful commodity to the plane he deserves? It is not our fault, if it is our misfortune that gas-works to the mass of men come under the category of chemical-works, with unpleasant associations, rather than "engineering" works. The moral is obvious and need not be elaborated. But I think there is room for optimism. "The proof of the pudding is in the eating," if one may strain a metaphor; and who can doubt but that the National Gas Exhibition in 1913 undeniably woke London and the Provinces to the daintiness of the dish, fit for kings, that we serve up, however sadly looked on is the place of manufacture. For once in a while the gas engineer got his due. In short, we were judged by our works, not by our "Works" [with a capital letter]; and thanks to the continued highly-enlightened missionary efforts in the Press of the "B.C.G.A.," the public are not going to be allowed to forget them. In something of the same sense a "central building" might prove a permanent advertisement; but how limited the appeal!

Gas-works, *ipso facto*—even with mighty gasholders thrown in—cannot stand out as so many "Forth Bridges"—engineering feats that naturally impress. The world knew about the making of the Nile Dam, and sang the praises of that mighty man, all honour to him, the Civil Engineer. Who bothered (say) about the first installation of vertical retorts except a few Technical Journals and their limited number of readers? The little ocean enclosed in a huge reservoir, the clustered machinery, and scintillating switchboard of an electrical generating station—these are sights that impress at a glance and perhaps awe. But a gas-works! The very fact that you had better don overalls if you want to pry into its secrets, or else face your tailor afresh, is, so to speak, the death-knell of interest. And doubtless many folk think you need a respirator as well if you are to get through in comfort. We know and treasure our gas-works; but we must admit to something "Futuristic" in our tastes. You will know, Sir, the story of the nature-lover who endeavoured to point out the immeasurable glories of an August sunset to an unappreciative friend, and—after Ruskin-like efforts—the answer he got. Simply this: "Augh-away!" One does not need to point a moral here either. Thus the echo of hymns of praise ringing down the corridors of the most palatial of central buildings from a chorus of members, bemedalled, and with half the alphabet after their names, would still fall on deaf ears in the world beyond, and have about as much effect as the late lamented "Hymn of Hate" from the throats of Kultur.

In short, until we have organized so many "National Exhibitions" up and down the breadth of the land, we must remain sadly content if an indifferent public gets no further than "Augh-away!" We are like preachers with a congregation aweary—they tend to fall asleep while we are taking our breaths. So we want to create a diversion; and I would plump for more exhibitions worthy of the name and every gas undertaking a "B.C.G.A." in itself.

So "the man in the street" will come to know us for what we are, and "social status" will follow as a matter of course, and the "cash" too.

C. M. WILSON.

*Aldershot, June 25, 1915.*

# REGISTER OF PATENTS.

## Removal of Ammonia from Coal Gases.

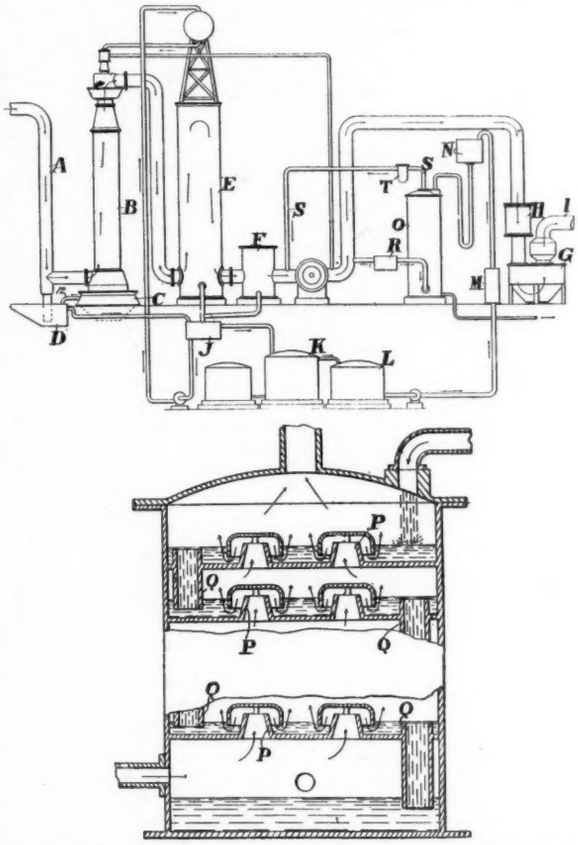
SCHUSTER, N., and BRITISH COKE-OVENS LIMITED, of Princes Street, Westminster.

No. 6061; March 10, 1914.

This invention has for its object (in the words of the patentees) the recovery, with greater efficiency and economy than heretofore, of ammonia, in the form of sulphate of ammonia, from ammoniacal liquor obtained during the purification of gases evolved in the process of distilling coal in coke-ovens, gas-retorts, and the like.

"To attain this object according to the invention, the ammonia is extracted from ammoniacal liquor by means of coal gas from which the heavy hydrocarbons have been removed; and for this purpose the necessary volume of gas to be employed for so extracting the ammonia is withdrawn from the main, is then reheated, and, after having been passed through an ammonia still in which it becomes heavily laden with ammonia, is returned to the main, and, together with the gas flowing through the main, is caused to enter a saturator. The returning gas, laden with ammonia, is caused to re-enter the main at a pressure greater than the gas at the part of the main where the returning gas so re-enters.

"In the extraction of ammonia from ammoniacal liquor, it has already been proposed to employ coal gas freed from its heavy hydrocarbons as a vehicle to extract ammonia from ammoniacal liquor by passing the gas through an ammonia still—the gas leaving the still laden with ammonia which was deposited in a saturator; and in such a process it has also been suggested that the gas, prior to passing the same into the ammonia still, shall be reheated. It has further been proposed that the gas shall be passed through heated ammoniacal liquor, and in some cases the gas may be also heated.




**Schuster's (British Coke-Ovens Company) Ammonia Recovery Plant.**

"As compared with the employment of steam for the extraction of ammonia from ammoniacal liquor, the process of ammoniacal liquor distillation as carried out by this invention effects an enormous saving of heat, and consequently of cost of production. This saving consists chiefly of the heat known as 'latent heat,' expended for the purpose of changing the liquid state of water at 212° Fahr. into steam of the same temperature. For instance, to heat 1 lb. of water from 32° Fahr. to 212° Fahr., 180·79 heat units are required; and in order to turn the water into steam of the same temperature—*i.e.*, 212° Fahr.—an additional 965·7 heat units are required, this being the 'latent heat.'

Now to heat up 1 lb. of coal gas from 32° to 212° Fahr., some 114 heat units are required—*i.e.*, about 1 ÷ 8·5 of the 'latent heat' referred to above.

"The gas for the process according to this invention is heated to a temperature of between 212° and 750° Fahr.; and if the stated minimum heat of gas is adopted, the ammoniacal liquor should be preheated to about boiling point. In substituting a given weight of steam required for the distillation of a given quantity of ammoniacal liquor at about 212° Fahr. by an equal weight of gas at a temperature of 212° Fahr., practically equal results are obtained with a considerably less expenditure of heat."

A general diagrammatic view of the plant employed in the process, and an elevation, partly in section, of a suitable form of ammonia still, are given in the illustration.

The crude gases pass through a pipe A into the lower end of a tower B, in which, as the gases pass upwards, they are subject to the action of scrubbing and cooling. A tar receiving vessel C (arranged at the lower end of the tower) is provided with an overflow pipe through which tar, as it accumulates, passes into a pitch basin D. The gas, after it has been treated in B, passes into a pipe communicating with the inlet end of a water-cooled condenser E (several of which may be employed in series). The gas which has been treated in B and has all the heavier tar constituents removed, after passing through the condenser, is drawn into a tar-extractor F by means of an exhauster arranged in the gas-main at the other side of the tar-extractor. From the exhauster the gas is passed under pressure through a main into a saturator G, which is supplied with sulphuric acid; so that the ammonia is deposited in the form of sulphate. The gas, prior to entering the saturator, passes through a cooler H, by means of which the temperature of the gas before entering the saturator can be lowered. The gas, after being treated in the saturator, passes away by a pipe I.

Tar accumulates in a collector J which receives its supply from a pipe leading from the upper end of the pitch basin, from a pipe leading from the condenser, and from a pipe leading from the extractor F by which the lighter tar constituents are removed from the gas. The ammoniacal liquor, produced by the process of cooling, flows, together with tar, into the collector, whence it flows into a settling tank K, where it is separated from the mixture of tar and overflows into a tank L. The liquor received in the tank is forced by a pump through an economizer M, in which it is preheated by passing through tubes subjected to the heat of waste gases prior to being forced into a feed tank N—the temperature of the ammoniacal liquor in the tank being preferably at about 230° Fahr.

From this feed tank the ammoniacal liquor flows into the upper end of an ammonia still O, which may (as shown) consist of a cylindrical vessel having in it a plurality of superposed partitions provided with upwardly extending gas-pipes P. The partitions are provided with liquor pipes Q extending through them at a certain distance above the partition and also to a predetermined distance below the partition—the height of the pipes above the partition being such as to allow of a certain depth of ammoniacal liquor to be retained above each partition. The pipes P are provided with bells which extend over their tops, the lower ends projecting into the liquor retained by the partitions.

Connected to the lower end of the still O, and below the lowermost partition therein, is a pipe through which gas from the exhauster main enters the interior of the still; the gas during its passage from the main to the still passing through a heater R, where the heat of the gas is increased to a temperature not exceeding 750° Fahr. and not below 212° Fahr. The gas, upon entering the still, passes in an upward direction through the pipes P of the partitions and under the bells, and leaves the upper end of the still through an outlet pipe S, which is connected to a part of the main in which the gas is at a lower pressure than at the part to which the other pipe is connected. Thus, in the arrangement shown, the outlet pipe S from the still is attached to the suction side of the main connected to the exhauster. By this arrangement the ammonia from the liquor in the still leaves in a vaporized condition and enters the exhaust main, so that the vaporized ammonia combined with the gas enters the main, mixing with the gas in it, and passing into the saturator G, wherein the ammonia is extracted from the gas and is deposited in the form of sulphate. A water-extractor T is preferably arranged in the pipe S, by means of which the major part of any water carried away by the gas current is extracted from the mixture of gas and ammonia as it leaves the still.

## Manufacture of Coke.

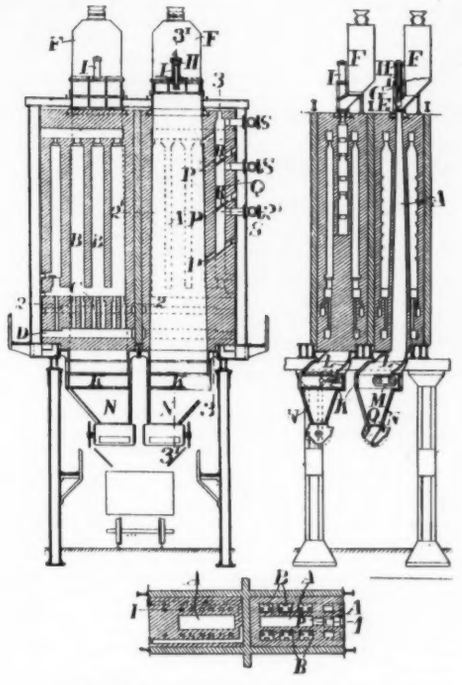
DUCKHAM, A. M'D., of Ashtead, Surrey.

No. 17,502; July 23, 1914.

While bye-product recovery ovens, the patentee points out, produce a satisfactory metallurgical coke, they are costly to maintain and are wasteful of heat, labour, and time, inasmuch as they are intermittent in operation. Furthermore, they are not universally applicable, as there are only certain coals which can be satisfactorily coked in them without admixture with other coals. The problem of continuous coking has been solved in the art of making coal gas by the use of vertical retorts; but the conditions for obtaining the best yield of gas are not those for making coke most suitable for metallurgical and other purposes.

It has been previously proposed, he says, in general terms to apply pressure to the charge to aid the coke in its descent to the lowest and hottest zone of the retort, wherein it was thought that the increase of density would occur. It has not, however, been previously recognized that the increase of density must take place in the earlier stages of coking in the upper part of the retort, and that consequently the required pressure must be exerted at these parts, and that any relaxation of the pressure must be for the minimum possible period.

The present invention is based on the observation that the successful production in vertical retorts of coke for metallurgical and other purposes is only to be attained by the application of mechanical pressure to the top of the charge, accompanied by the continuous removal of the coke from the bottom of the retort. The pressure must be uniformly applied over the cross section of the charge, and continuously exerted—that is to say, the pressing device must follow the descending charge; being lifted only for the very short period requisite for admission of fresh coal at the top of the retort.



**Duckham's Vertical Coke-Making Retorts.**

In the illustration is shown a setting of four retorts suitable for the invention. Fig. 1 is a vertical section on the line 1 of fig. 2. The left-hand half of fig. 2 is a horizontal section on the line 2[1]. The left-hand half of fig. 3 is a vertical section on the line 3 of fig. 1; and the right-hand half is a like section on the line 3[1].

The retorts A (of the usual rectangular cross section, the area of which increases downwardly) are heated by vertical flues B; the heating gases passing upwards, instead of downwards. The combustible gases enter through flues C, while secundary air enters at D and passes around the lower part of the retort to cool the coke and to become itself preheated. The retort is charged to the level of the foot of the extension E. The lower part of the latter constitutes the charging shoot of a hopper F, while the upper part receives the ram G, operated by the piston H moving in the cylinder I. In the position shown, the ram has been lifted from its lower position (indicated by dotted lines) to allow a fresh charge of coal to flow into the extension E. Immediately following this flow, pressure is again applied to the ram, and is maintained while the fresh charge is entering the retort at a rate fixed by the rate of discharge at the bottom of the retort. In this manner, the charge in the retort is kept under constant pressure except for the very short periods during which the ram is being withdrawn and the fresh charge is flowing into the extension E. The hopper F is sealed by the rotary feed at the top and by the ram, so that the retort is gas and air tight.

The general construction of the extension K at the lower end of the retort is already known. The curved surface L takes the greater part of the weight of the charge, and the continuous removal of the coke is by means of an endless travelling band M made up of chain links. [This particular form of device for removing the charge does not constitute a part of the present invention.] The hopper N, into which the coke falls, is periodically discharged by turning the water-sealed door O. The openings P for the escape of volatile products are at different levels in the side of the retort and lead directly into a flue Q provided with dampers R, so that it can be partitioned into chambers which collect the products from the several zones of the retort in order that they can be separately withdrawn through off-takes S. By removing one or more of the dampers and closing the corresponding off-takes, the products may be allowed to mix in the flue Q, to be withdrawn together at (say) the highest off-take.

## Telphers Adapted to Carry Tripping Skips.

ROBERT DEMPSTER AND SONS, LIMITED, and ROWLANDS, J. C., of Elland.

No. 18,996; Aug. 24, 1914.

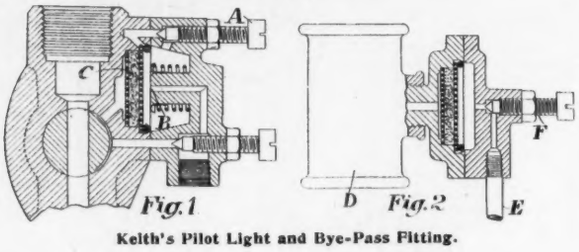
This invention relates to telphers, cranes, and the like, adapted to carry skips or receptacles on which a catch or lever is operated when it is required to discharge their contents—the hoisting ropes for the skips being wound on to a drum. The principal object of the invention is to prevent slackness or uneven winding of the tripping rope of the skip which would otherwise be liable to overlap in winding, with detrimental effect on its working. For this purpose, an automatic slide is provided which ensures correct winding of the tripping rope in combination with counterweights which regulate its tension.

## Gas-Lamps.

KEITH, J. & G., of Farringdon Avenue, E.C.

No. 18,669; Aug. 14, 1914.

This invention relates to bye-pass governors, automatic lighting devices, and the like "involving the employment of a pilot light liable to be extinguished by the deposit, when the lamp is not burning, of small quantities of water contained in the gas." The invention contemplates the provision of means located in advance of the point where the supply is checked, for collecting moisture liable to settle on cold surfaces contacted intimately by the gas.




**Keith's Pilot Light and Bye-Pass Fitting.**

Fig. 1 is a vertical section showing a combined cock and governor; fig. 2 shows the invention applied to an ordinary bye-pass.

In fig. 1, it may be assumed that the condensation most to be feared is that which would take place in the portions of the governor where the gas passes through small orifices such as that controlled by the check screw A, and at the valve portion B, where the gas comes into contact with cold metal. A wad C—of absorbent material, such as felt or cotton wool, and soaked in aqueous solution of calcium chloride or other hygroscopic substance—is of sufficient area and bulk to collect all the water likely to be contained in the comparatively small quantity of gas required for the pilot light while the lamp is not burning; and when the lamp is alight, the heat conveyed to the governor is sufficient to vaporize and expel the surplus moisture—the wad being left in a sufficiently dry state to be capable of again attracting moisture when the lamp is extinguished.

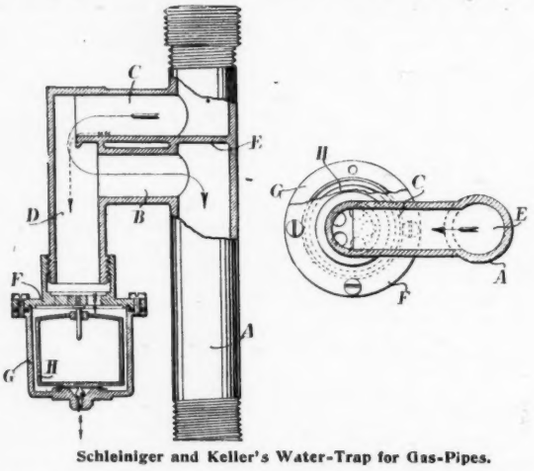
With modification the invention may be applied to automatic lighters and to pilot light fittings of all kinds for high or low pressure and other apparatus of a similar character liable to be affected by the deposit of moisture contained in the gas. For example, as applied to an ordinary bye-pass device it is shown in fig. 2. Here the tee-piece D represents the usual main supply to the lamp; E, the connection to the pilot light; and F, the regulating screw.

## Collecting and Discharging Water from Gas-Pipes.

SCHLEINIGER, C. A. & O., and KELLER, J., of Wohlen, Switzerland.

No. 514; Jan. 12, 1915. Convention date, Jan. 13, 1914.

This invention relates to devices for draining water from gas-pipes and the like, and to devices of the class in which the water is collected in a chamber containing a float fitted with a valve which controls the water discharge from the chamber in such a manner that a body of water is always present in the float chamber to act as a water-seal.




**Schleiniger and Keller's Water-Trap for Gas-Pipes.**

A is a pipe adapted to be inserted into the gas-pipe, in approximately vertical position. The pipe is connected by two cross-pipes B C to a branch pipe D parallel to the insertion-pipe, and is sub-divided by a partition E between the cross-pipes. The front edge of the pipe C (above the cross-pipe) projects to the centre of the branch D, and is provided with a dripping lip. To D is connected a disc F, provided with openings arranged round a downward central pin; and to the disc is connected a cylindrical tank G provided in the centre of its bottom with a conical opening widening upwardly. In the tank is a float H guided on the pin and having on its under surface a knob which rests in the funnel-like widening of the opening, thus closing it.

The pipe A is inserted into the gas-pipe close in front of (say) a lamp, and the water collecting in the latter and dripping from the cross-pipe C into the branch D is conveyed into the tank G. When the water in the tank has reached a certain level it raises the float H, so that the opening below is released, and the water in the collector escapes until, the quantity of water in the tank becoming smaller, the float sinks so that the knob again closes the opening.

# PARLIAMENTARY INTELLIGENCE.

## HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bill brought from the Commons, read the first time, and referred to the Examiners: Gas and Water Provisional Orders (No. 3).

Bills reported, with amendments: Chelmsford Gas, Lurgan District Council, Ammanford District Council.

Bill read a second time and committed: Weardale and Consett Water.

Bills read the third time and passed: Ammanford District Council, Irvine and District Water Board, Kilmarnock Gas, Port-Glasgow Gas, Skegness District Council Gas.

Bills Royal Assented: Brighton and Hove Gas, Forfar Gas, Irvine and District Water, Ormskirk Gas and Electricity, West Gloucestershire Water.

The Annfield Plain Urban District Council and others, and the Sunderland and South Shields Water Company have deposited petitions against the Weardale and Consett Water Bill.

## HOUSE OF COMMONS.

The following progress has been made with Bills:—

Bill read the first time and referred to the Examiners: Kilmarnock Gas.

Bills considered: Warwick Gas, Altrincham Gas.

Bills reported, with amendments: Gas and Water Provisional Orders (No. 2), Prescot Gas, Wolverhampton Water.

Bills read the third time and passed: West Gloucestershire Water, Gas and Water Provisional Orders (No. 3), Irvine and District Water.

Bill passed: Gas and Water Provisional Orders (No. 3). [Cheadle, Heathfield and Waldron, Liverpool, Mid-Kent, Rothwell, Fisherton Anger and Bemerton.]

The Northwich Gas [Lords] and South Staffordshire Water [Lords] Bills will be considered in Committee to-day, and the Ashington District Council Bill to-morrow (Wednesday).

Petitions against alterations in the Ashington District Council [Lords] Bill have been deposited by Major the Hon. Hugh E. Joicey, the Morpeth Rural District Council, and the Duke of Portland, K.G. The North-Eastern Railway Company have withdrawn their petition against the Bill.

The Cheshire County Council have withdrawn their petition against the Hoylake and West Kirby Order.

## MUNITIONS OF WAR BILL.

The object of the Munitions of War Bill is to make provision for furthering the efficient manufacture, transport, and supply of munitions for the present war. There are sixteen clauses, and three parts. Part I. deals with the settlement of labour differences, and the prohibition of lock-outs and strikes in certain cases. The "differences" referred to are "differences as to rates of wages, hours of work, or otherwise as to terms or conditions of, or affecting, employment on the manufacture or repair of arms, ammunition, ships, vehicles, or any other articles required for use in war, or of the machines or tools required for that manufacture or repair; and also any differences as to rates of wages, hours of work, or otherwise as to terms or conditions of, or affecting, employment on any other work of any description if this part of the Act is applied to such a difference by His Majesty by Proclamation on the ground that in the opinion of His Majesty it is expedient in the national interest that this part of the Act should apply thereto." This part of the Act may be so applied to such a difference at any time, whether or not a lock-out or strike is in existence in connection with the difference to which it is applied. If the Minister of Munitions considers it expedient, for the purpose of the successful prosecution of the war, that any establishment in which munitions work is carried on should be subject to special provisions as to limitation of employers' profits and control of persons employed, and other matters, he may make an order declaring that establishment to be a "controlled establishment." Part II. sets forth the provisions which shall apply. The third part, among other things, gives power to the Minister of Munitions to require information from employers.

## NOTTINGHAM GAS RESERVES.

A question of far-reaching importance in relation to the application of reserve funds of municipal trading undertakings has arisen in connection with the Bill of the Nottingham Corporation seeking authority to acquire the statutory rights of the Trent Navigation Company in the river between Newark and Nottingham, and for power to construct new locks and deepen the channel between these points, so as to convert Nottingham into an inland port. The Council had committed themselves to draw upon the reserves of the gas or other corporate funds in support of the scheme. Originally, formidable opposition in regard to the allocation of the municipal funds was threatened in connection with the proceedings before the House of Commons Committee; but the intended objectors, representing property owners and other ratepayers, were denied *locus standi*, with the result that a possible obstacle to the Corporation's progress was removed, the preamble of the Bill being allowed.

But taking a different view from the tribunal representing the other chamber, the House of Lords Committee (presided over by Lord Ribblesdale) before whom the measure came for consideration last

week, allowed a wider latitude of opposition—permitting the owners who had petitioned to state their case through Counsel and witnesses. The original resolution committing the Council to support the scheme was comprehensive enough to entail drawing upon the reserves of most of the trading concerns; but, in point of fact, it was made clear that it was upon the gas funds that the burden must ultimately fall, if financial exigencies needed. Strong exception was taken by the Chairman of the Gas Committee and others to trenching upon resources which have been built-up as a result of years of careful administration, partly with the object of meeting the cost of large schemes of gas-works reconstruction, to which the Committee have long been pledged, but mainly for insuring against contingencies which cannot be foreseen. It was urged by the promoters that without the financial help of the Corporation the scheme would be impossible of fulfilment; but when the principal engineering witness for the promoters was asked why the surplus funds of the Corporation trading undertakings should be taxed for the purpose of the suggested improved navigation, he was unable to give any reply, other than that he believed the subsidiary clause in relation to the matter was in the nature of a standard clause.

The case before the Lords Committee dragged on throughout the whole of last week, the evidence for the petitioners only concluding on Friday; and it seems probable that the investigation will extend over several more sittings.

## SOUTHAMPTON ELECTRIC LIGHTING ORDER.

### Gas Company and "Northumberland Clause."

**HOUSE OF COMMONS COMMITTEE.—Tuesday, June 22.**

(*Before Sir* EDWARD CORNWALL, *Chairman, Sir* JOHN SPEAR, *Sir* J. HASTINGS DUNCAN, *and Mr.* TIMOTHY DAVIES.)

This Order, which was contained in the Electric Lighting Provisional Orders (Confirmation Bill), No. 3, deals with an extension of the Southampton Corporation electric supply area.

Counsel for the Corporation were Mr. C. S. VESEY KNOX, K.C., and Mr. TYLDESLEY JONES. The only opponents, the Southampton Gas-light and Coke Company, were represented by Mr. A. M. PADDON.

Mr. VESEY KNOX, in opening, said the object of the Order was to extend the area for the supply of electricity by the Corporation into the parish of Bitterne, immediately outside the borough. The Order had already been passed by the Board of Trade; and the Rural District Council of Stoneham, in whose area Bitterne was, supported it. The only opposition was from the Gas Company, who supplied in Bitterne and other adjacent districts. The Company had already been heard by the Board of Trade, and now appeared before the Committee. The real object of the opposition was to secure the insertion of the Northumberland clause. The Company asked for the clause to be applied not only to Bitterne, but to the whole of the County Borough of Southampton.

Mr. PADDON said he was going to ask the Committee to reject the Order as unnecessary, or, if they passed it, to insert the Northumberland clause.

Mr. VESEY KNOX said that this involved the suggestion that a supply of electricity was not necessary in Bitterne. The Gas Company were a maximum price Company, and were under the sliding-scale; and being in the happy position of having ample funds always to pay the maximum dividend, they could indulge in these little luxuries at the expense of their consumers without in any way affecting their shareholders. If the Northumberland clause was put upon the Corporation in the way suggested, it would mean that no long-period contracts for power supply could be entered into; for no commercial undertaking would agree to a revision in the circumstances of the Northumberland clause. The history of the Southampton undertaking was that in 1896 a Company was formed, and in 1909 sanction was obtained to supply the districts of North and South Stoneham, which were outside the borough. In the previous year, 1908, a Provisional Order was promoted asking for various additional powers in respect of the electricity undertaking; and on this occasion the Gas Company asked that the Northumberland clause should be inserted. The Corporation pointed out how successful the undertaking had been, and that profits had been made during the previous five years. The Gas Company thereupon did not press the question. When the Stoneham Order was promoted in 1909, the Gas Company did not ask for the clause. As regards the prospects of the Bitterne area, the Corporation already supplied a number of houses under the "fringe" Order of the Electric Lighting Act of 1909, and, in addition, there were several houses in a garden city scheme which had been wired and were actually waiting for a supply. The initial capital expenditure in the district would only be £400, apart from the costs of the Order, which, owing to the opposition of the Gas Company, would be considerable. On the face of it, the point was a small one so far as the Gas Company were concerned; but the fact was that the electrical undertaking had been so developed that it was becoming a formidable competitor of the Gas Company, who wished to hamper the Corporation all they could. At the end of 1914 the balance carried forward was £5137, after providing for all capital charges. Current was supplied for lighting at 3d. per unit, for heating at ½d. per unit, and for power down to ¾d. per unit, according to scale, and even less in the case of some large contracts. An important contract had been entered into with Messrs. Pirelli on a fifteen years' basis at very low rates; but if the Northumberland clause were put upon the Corporation, it would be impossible to enter into similar contracts in the future. The Corporation desired to encourage manufacturers to come to Southampton. Such progress had been made with the heating supply that over a million units per annum were now sold for this purpose alone. The electrical undertaking had been subject to the most healthy criticism; and so careful were the Corporation that everything should be in good order that they had called in a leading electrical expert—Sir John Snell—only last year to report, and he had come to the conclusion that the undertaking was excellently managed and in a most satisfactory position financially. The total cost of generation was 1·603d., and the total average receipts 1·736d. per unit, which represented, assuming the undertaking to be in the hands of a company, a dividend of 8·2 per cent. on the capital. Thus a heating supply at ½d. per unit was fully justified in its general effect upon the undertaking.

The CHAIRMAN asked whether, having regard to the contracts which had been entered into for supply, there was anything in the Northumberland clause which would have prevented the Corporation entering into them.

Mr. VESEY KNOX said he did not think there was anything in the clause which would interfere, so long as the years were favourable and the undertaking was earning good profits.

The CHAIRMAN said he gathered that while times were good there was nothing in the clause which would interfere with the way the Corporation had been going on, except that it might prevent long contracts being entered into.

Mr. VESEY KNOX agreed, but added that there might be a serious effect in the future, having regard to the increased cost of coal.

The CHAIRMAN agreed, and said that he was not for the moment carrying his mind forward.

Mr. VESEY KNOX, continuing, said with the Northumberland clause a gas company could force the Corporation to raise its prices in the event of quite a temporary rise in the cost of coal; and this, he contended, would prevent any undertaking being carried on upon commercial lines.

Mr. PADDON pointed out that the clause provided that the increase of prices should only be carried out where reasonably practicable.

Mr. VESEY KNOX agreed, but doubted whether this would cover the case he had mentioned. If the words had been "so far as commercially desirable," it would be a different matter. It was a fact that Sir John Snell had advised an important gas company in regard to enforcing the operation of the Northumberland clause upon a local authority who had had the clause put upon them by Parliament. Sir John, after carefully considering all the facts, advised the company that in the event of the clause being put into operation, and the prices for electric supply being increased, the effect upon the rates, in which the gas company would have to share, would be that there would be further losses. It was realized by the company that it was impracticable to make the clause effective, and they had dropped the matter. There was considerable doubt in the wording of the clause as to what the actual meaning was intended to be. Reference was made to so adjusting the charges to "ordinary consumers" that there should be no loss upon the undertaking. What was an "ordinary consumer?" Did it mean the power consumer, the heating consumer, or the lighting consumer? It might put the supply undertaking in this position: Supposing in the case of lighting consumers, by the introduction of the new half-watt lamp in small sizes it was felt reasonable to increase the charges on this account owing to the reduced consumption of energy per lamp, nevertheless the supply authority might be compelled, notwithstanding a reduction in the price of coal, to correspondingly increase the charges to the power consumer. Taking all the circumstances into account, he had no hesitation in asking the Committee not to insert the clause. This was the first case in which a gas company had asked for the clause at the hands of the Board of Trade and been refused. The Gas Company really had no case in this instance, because not only was the undertaking being carried on at a profit, but Sir John Snell's exhaustive report last year also showed that the public lighting was, if anything, being charged at too low a rate.

Sir *John Snell* gave evidence in support of the Order, and expressed the opinion that Bitterne was an eminently suitable place for electricity supply. He regarded the Northumberland clause as mischievous, mainly from the point of view of entering into large contracts. In the case of the Pirelli contract, no coal clause—viz., that the price per unit should fluctuate according to the price of coal—had been inserted; but the price was such that, even with a permanent increase of 25 per cent. in the cost of coal, there would be a profit on the transaction. Personally, he would have preferred a coal clause and a lower standard price per unit; but he did not negotiate the terms. In the case of large contracts for power supply, he would advocate a coal clause. He confirmed Counsel's statement with regard to his advice to a gas company as to the impossibility of enforcing the Northumberland clause. In the case of Winchester, in 1911 he had actually supported the insertion of the clause on behalf of the Gas Company; but he had now completely changed his opinion.

In cross-examination, witness said that, although a loss was made on the parishes of North and South Stoneham (which were outside Southampton) in the early years, there was now a profit being made upon these districts; and he saw no reason why a profit should not be made in Bitterne. He did not agree with Counsel that because current was being sold at ½d. per unit and the total costs of generation were 1·603d. that the electrical energy was being sold at a loss. It was not fair to compare the price received for a class of supply such as heating with the average cost of generation. The actual cost of each class must be taken by itself and compared with the price received; and if this were done, it would be found that there was a profit on the heating units. Counsel put it to witness that in the event of a loss on these outside districts the ratepayers in Southampton had to bear it. Witness agreed that the present prices charged might not be justified if the price of coal remained at its present high level; but he regarded this as a temporary position. The existing price, however, would stand a permanent increase in the present price of coal; and this increase in the cost of generation on the one hand would be counteracted by the general tendency in electrical generation for less current to be consumed per unit generated owing to greater efficiency in the plant, as time went on.

The CHAIRMAN asked if the Pirelli contract could be seen.

Mr. VESEY KNOX said the Corporation felt they could not disclose it in this case.

Mr. PADDON said he did not wish to see it, nor did he wish any of his people to see it. The argument, however, was that it was a contract for 15 years at a price below the cost of production.

*Witness* would not agree with this, for the reason already given as regards the heating supplies. As a matter of fact, the average price

obtained from Pirelli was high for a large industrial supply. There was no fear of a loss upon it.

The CHAIRMAN said that probably two years ago nobody would have attached much importance to this point as to the effect of the cost of coal upon the price charged; but everyone was now bound to realize the serious aspect of it. Indeed, Sir John Snell had come to the conclusion that he would be bound to advise all electric supply authorities to have coal clauses in large contracts.

Mr. PADDON put a few questions as to the class of houses in Bitterne, and pointed out that of the 831 houses there the Gas Company already supplied 686. Furthermore, the bulk of the houses had a rateable value of less than £14. Discussing the case mentioned by Sir John Snell in which a gas company had been advised that the Northumberland clause could not be enforced, he said that although this might be the only case in which an attempt had been made to enforce the clause, it was probably a fact that in a large number of other cases the spirit of the clause was being loyally adhered to, and prices charged which did not need revision.

*Witness* said that he knew of no case where prices had been revised under the Northumberland clause. In the course of further cross examination he said that, although the margin of profit per unit was very small, it represented a large sum in the aggregate in net profit on the undertaking.

In answer to Mr. TIMOTHY DAVIES (a member of the Committee), witness said that if the clause were put upon the Corporation it would be impossible to enter into similar contracts to the Pirelli contract in the future.

Mr. VESEY KNOX pointed out that before the Board of Trade the Corporation had said that rather than have the clause put upon them they would drop the Order altogether.

Mr. PADDON, who did not call evidence, then addressed the Committee on behalf of the Gas Company. The Company had been represented as coming before the Committee with a desire to interfere with their competitors. They had no such attitude in mind at all. In 1908, when the Corporation came for a Provisional Order, which did not seek an extension of area, the Northumberland clause was asked for; but the explanation then given was considered satisfactory by the Company. In 1909, the Corporation went outside the area, and the Company then did not ask for the clause. But the result of the next two years' trading was a loss in respect of these outside districts; and it was therefore that, having watched and seen the course of events, the Company now thought they should be given similar protection to that which so many other gas companies had in different parts of the country where corporations were trading outside their area and carried on ordinary trading concerns in competition with gas companies. Not a single argument had been brought forward against the clause which had not been put before Parliament *ad nauseam* since the clause was introduced as the "Bermondsey Clause." The Committee were now asked to believe that it was impracticable after being twelve years in operation. The point as to its interference with long contracts could very well have been made by Sir John Snell in 1911, in the Winchester case, yet it was not. All the arguments which had been put forward were against the principle of the clause, which had been settled by Parliament long ago. It was the essence of sound commercialism that any price charged for a commodity should be adapted to the cost of the material employed in its production. It was for this reason that the Gas Light and Coke Company had been forced to increase their price from 2s. 6d. to 3s. per 1000 cubic feet; and the same principle should apply to municipal undertakings, particularly when they were carried on outside the area of the corporation in competition with gas companies.

The CHAIRMAN, after a short deliberation, announced that the Committee would pass the Order without the clause.

## PRESCOT GAS BILL.

This Bill was considered on Thursday last by the Committee of the House of Commons on Unopposed Bills, presided over by Mr. MACLEAN.

Mr. BROWNE (Parliamentary Agent) stated that the proposals of the Bill included the conversion of the different classes of shares and their consolidation into a uniform stock bearing 5 per cent. interest, and the substitution for the present illuminating test of a calorific standard. The provisions of the calorific standard clause had been considered by some of the local authorities concerned; and the clauses, as they were presented to the Committee, were agreed with them. The standard prescribed was 500 B.Th.U., with power to the Board of Trade to vary the standard at the end of the three years, on the application either of the Company or of any one of the local authorities having jurisdiction in the limits of supply. At the suggestion of the Local Government Board, the power possessed by the Company under previous Acts, of converting borrowed money into capital, had been repealed. The new share capital asked for was £18,000. It had been cut-down to this from £28,000.

Mr. *J. E. Hall*, the Manager and Engineer to the Company, stated that between 1900 and 1914 the capital expenditure of the Company had been £22,000, and last year the undertaking showed an increase of 12½ per cent.

The Committee passed the Bill, and ordered it to be reported for third reading. The measure has already passed the House of Lords. [See "JOURNAL," May 18, p. 411.]

## CHELMSFORD GAS BILL.

This Bill, which provides for the purchase of the Chelmsford Gas Company by the Corporation, was sent forward last Tuesday for third reading by the Unopposed Bills Committee of the House of Lords. The Bill has already passed the House of Commons. [See "JOURNAL," May 4, p. 285.

## LURGAN URBAN DISTRICT COUNCIL BILL.

The Unopposed Bills Committee of the House of Lords last Tuesday sent this Bill forward for third reading. It provides for the purchase of the Lurgan gas undertaking; and full particulars were given when the measure was before the House of Commons. [See "JOURNAL," May 4, p. 285.]

## WOLVERHAMPTON WATER BILL.

This Bill was last Tuesday sent forward for third reading by the Unopposed Bills Committee of the House of Commons. The terms of a long clause in the Bill for the protection of the Wolverhampton Gas Company's mains were given in the "JOURNAL" for May 11, p. 341.

# LEGAL INTELLIGENCE.

## GAS COMPANIES AND THE REPAIR OF ROADS.

References have been made on several occasions in the High Court of Justice, and duly recorded in our "Legal Intelligence" [see "JOURNALS" for Sept. 22 and 29 and Oct. 6 and 13 last year], to two actions of the Gas Light and Coke Company *v.* Woodford Urban District Council and Wanstead Urban District Council; the plaintiffs seeking an injunction restraining the two Councils from repairing certain roads in their districts with reinforced concrete.

At a meeting of the Woodford Urban District Council earlier this month, the Clerk, in the course of a statement on the matter, said: The idea of the Company was that the putting-in of reinforced concrete foundations would be a serious inconvenience to them in getting access to the mains. Apart from this, there was the important and interesting legal question as to how the interests of a private company could be allowed to interfere with the duties of local authorities in the management and control of their roads. But from the point of view of the Council it was satisfactory to know that experiments had been made concerning reinforced concrete and ordinary concrete, and went to prove that the former was no greater hindrance to the Company's requirements than ordinary concrete. The Company had now withdrawn their action.

## Compensation for a Gas Explosion.

In the Bow County Court last Tuesday, His Honour Judge Smyly gave his considered decision in an application made for a review of an award under the Workmen's Compensation Act, made in favour of Henry Coalman, of Abbotts Road, Poplar; the respondents in the arbitration being the Thames Iron-Works Company. In 1911 Coalman was engaged at the Company's works, when there was a big escape of gas noticed; and he went searching for the source with a naked light. The result was an explosion, which severely burned him, and also caused shock and paralysis. For close upon four years he had been drawing 14s. half pay; but the Company contended that he was sufficiently recovered to do his old work, or, if not as much as he did, something anyway to lighten the amount of compensation. His Honour said the man was now a permanent sufferer from *paralysis agitans*. There was no doubt that the disease had been latent in his system, and it was a very slow one; but it had been brought on with a rush by the shock of the gas explosion. The question was whether he could earn anything that would substantially assist his employers as to his compensation. He had had the assistance of Dr. Smith sitting with him as Medical Referee, who agreed that the man could not do anything substantially. He considered he was still entitled to the 14s. a week. He agreed the Company should be allowed to redeem on the basis of 75 per cent. of an annuity of a man of 59 years at 14s. a week. This sum would be £323. With the compensation already paid, the gas explosion will cost the Company £450, without law costs.

**Irish Gas Prices.**—The Newry Urban Council Gas Committee have increased the price of gas, as from July 1, 5d. per 1000 cubic feet (from 4s. 2d. to 4s. 7d.), and the price of coke by 3s. per ton. In Portadown, the Gas Company's proposal to increase the price of gas to 4s. 7d. has been referred by the Urban Council to the Lighting Committee for consideration and report. The Limerick Corporation Gas Committee notify that, from June 30, the price of gas for all purposes will be raised 5d. per 1000 cubic feet. This is the second advance within the last couple of months, and brings the price up to 3s. 8d. per 1000 cubic feet.

**Coal-Miners' Agreements.**—Negotiations between the Northumberland miners and coalowners with regard to suspending the Eight-Hours Act have been adjourned until the 3rd prox.; it being understood that the Miners' Federation, on the recommendation of the Departmental Committee on Coal Production, and at the instigation of the Minister of Munitions, will convene a national conference to deal with the subject of increasing output, as well as the question of bringing the miners into line with the engineering trades in the agreement with the Government regarding compulsory arbitration for the period of the war. The South Wales deadlock is also being considered by the Executive Council of the Miners' Federation; and there is said to be just a possibility that this body will advise the Welsh Miners to continue the old agreement, as it advised the Northumberland men to continue working under the current sliding-scale agreement for the period of the war.

# MISCELLANEOUS NEWS.

## THE DEPARTMENTAL COAL COMMITTEE.

### Evidence of Mr. D. Milne Watson.

In the "JOURNAL" for April 6 [p. 17] there appeared a summary of the report of the Committee appointed by the Board of Trade to "inquire into the causes of the present rise in the retail price of coal sold for domestic use." The fifteen sittings of the Committee took place during February and March; and a number of witnesses (more than thirty) were examined. The members of the Committee were: Mr. Vaughan Nash, C.V.O., C.B. (Chairman); Professor W. J. Ashley, Birmingham University; Mr. J. Boyton, M.P.; Mr. W. Crooks, Labour Member for Woolwich; Mr. J. J. Dent; Mr. A. W. Flux (Director of the Census of Production, Board of Trade); Mr. Stanley Machin; and Mr. J. Rowlands, M.P. From the minutes of evidence just published, the following account has been prepared of the statements made by Mr. D. MILNE WATSON, the General Manager of the Gas Light and Coke Company. In connection with this account, it is, of course, necessary to keep in mind the dates—at the beginning of March—on which the evidence was given.

The first questions which were addressed by the Chairman to the witness, when he was examined on March 4, had reference to coke. This, it was admitted, was not included in the terms of reference; but it was pointed out that coke is a competitor with coal—at any rate, for the poor man's fuel. Asked as to whether he could tell the Committee anything about the effect of recent conditions on the amount of coke available for sale by a gas-works, witness replied that the effect of what had been happening lately had been very greatly to reduce the amount of coke being made for sale at the moment. The difficulty in obtaining coal had obliged most gas companies to resort to the use of larger quantities of oil in place of coal. This had led to a material falling-off in the production of coke; and, at the same time, of course, coke was used in the making of carburetted water gas. The price of coke had been gradually going up; and it might be taken that the chief reason why this was so was because the price of coal had risen. It was a question of supply and demand. At the moment, his Company could not possibly supply the requirements; and at some of their works they were three weeks behind with orders. They were, as far as possible, trying to keep it for contracts and regular customers. Before the war, coke was 10d. per cwt.; and it had risen to 1s. 3d.—that was to say, from 16s. 8d. to 25s. a ton in the yard.

The CHAIRMAN: Of course, a London consumer is used to getting his heating in the form of coke and gas. There, again, he has been hit?

*Witness:* Yes. The result of the dear coal and high freights must mean an increase in the cost of production.

If you can substitute oil for coal in increasing quantities, what is the effect of this going to be on price?—We cannot very well increase the proportion of oil over what we have been using this last winter, because we have only got a certain proportion of plant which we can work. We have been up to our practical maximum.

Mr. ROWLANDS: You are limited in the quantity?

*Witness:* No. It has always been understood that, as a matter of fact, in common practice we would not make beyond 25 per cent. of our make from oil; but in these exceptional times we have had to utilize the plant as best we could.

Explaining the conditions of gas supply, witness remarked that the price of gas had gone up. At that time the Company had, in round figures, half-a-million automatic consumers; and there were in use by them no less than 400,000 stoves. That was to say, about 80 per cent. of them had stoves on which they cooked. The whole *raison d'être* of the automatic meter was that the poorer classes could not, as a rule, afford to fit up their houses with pipes and all the appliances that would be necessary to use the gas. Therefore the gas company stepped in, and installed automatic meters (by which people were prevented running up heavy debts for gas), and supplied them with a complete outfit for consuming the gas, for which they were entitled by Act of Parliament to charge 10d. per 1000 cubic feet more than in the ordinary way. As to other meters, the Company had about 300,000 ordinary consumers, who had altogether 460,000 stoves. In addition to stoves, of course, there were boiling-rings. A great many of the working classes used boiling-rings for all their cooking; and there were no less than 335,000 of these out in the district.

To give the Committee some idea of how prices were affected, witness said it might be taken as a rough rule that when the price of coal or the cost of carriage went up 1s. a ton, in either of these cases it meant an increase in the price of gas of 1d. per 1000 cubic feet. Freights had gone up from 3s. to 12s. per ton; and 15s., and even 17s. 6d., had been paid. But 12s. was quite common; and this would mean a rise of 9d. per 1000 cubic feet. Coal had also gone up from 3s. to 5s. a ton according to position. His Company always made their contracts for a year; and they had coal to carry them on at least to July. But they had had to pay something extra on the coals that were being brought in, simply because of the difficulties existing. There were war risks; and the gas companies had also had to meet merchants with regard to freights. The original prices were made in peace time; and contractors could not be absolutely held to them.

The CHAIRMAN: Our terms of reference are confined to house coal; but we found, on making inquiries, it was difficult to draw a hard-and-fast line between house coal and steam coal.

*Witness:* You cannot possibly draw a hard-and-fast line. I am told that at the present moment the Tyne is absolutely full of Swedish and Norwegian vessels which have come in for the purpose of taking coal for the Swedish and other railways. I understand that the London and North-Western Railway Company and other companies are for the first time going to Durham for coal.

In answer to further questions by the Chairman, witness said the longer and warmer days would not be likely to ease the situation, because gas companies looked to the summer to make up their stocks. His Company's normal quantity was something just short of 2,000,000 tons of coal a year, or an average of 40,000 tons a week. The difficulty in getting coal was due to trouble through shortage at the pits and through questions of freight. All their contracts were in arrear.

Answering Mr. ROWLANDS, witness stated that 1d. per 1000 cubic feet on the consumption of his Company's gas meant about £110,000 a year. To the South Metropolitan Company the difference which 1d. per 1000 cubic feet would make would be £55,000 a year, and to the Commercial Company £14,000. He had not got the corresponding figure for the South Suburban Company; but he assented to the suggestion that, with regard to the four Companies mentioned, a rise of 1d. per 1000 cubic feet would mean a penalty upon the consumers of roughly £200,000 a year. He pointed out, however, that there were also various other companies in the London area. A great part of the extra cost would, of course, fall on the prepayment consumers. Then there were the ordinary consumers, and also a number of small industries dependent largely upon gas for their power. For example, the newspaper offices melted their lead by gas; and in restaurants a great deal of the cooking was done by the same means. The question of the high price of coal was of enormous importance indirectly. With regard to coke, there was one other point he would like to mention. It was essentially the poor man's fuel, and enormous quantities were used which were purchased in paper bags. The Company had a system, which was exceedingly popular with the consumers, of selling coke in 28-lb. paper bags. Of course, the price of these had gone up. Before the war, it was 3½d.; and at the present time it was 4½d. per paper bag.

Mr. FLUX: Your contracts are made with the colliery, not for delivery in London?

*Witness:* They are made on both systems. We buy coal delivered in London, and we buy it f.o.b. and supply the ships. We have one vessel of our own running, and we have two or three chartered; and since the new year we have bought three new steamers, as being the only way to get our supplies. We had to pay a very high price for these steamers, which all goes to swell the cost of production.

You have not had any difficulty in getting the collieries to implement their contracts. They have not claimed a reduction in deliveries at contract prices?—A great many of them have got badly in arrear; but the Gas Light and Coke Company's contracts are of such a nature that I do not think they could claim exemption. I do not think they could claim suspension.

You are particularly anxious about the new contracts that are pending?—The difficulty has been to get the coal carried. We have had to increase our cost by taking up boats—the boats that have lately been interned. When a contractor has lost all his boats, it is impossible for him to deliver the coal. All the companies have been losing stock steadily. In the last three or four weeks our stock has gone down about 10 per cent.; and in dealing with the larger number of companies outside, I think you will find the stocks have dropped even more, because the Gas Light and Coke Company's stocks had dropped so low that we had to take exceptional steps.

Did you start the season with an exceptionally low stock?—No; it was exceptionally high. In June, it was very high. In November, it dropped 50,000 tons, in December 90,000 tons, in January 60,000 tons, and so on.

Referring again to coke, he said it was a fact that there had been some difficulty about the transport of coke from the Company's works to the centres where the merchants wanted to sell it. The trouble, however, was not serious, and arose simply from the quantity of coke manufactured and left free after meeting the carburetted water-gas requirements. Speaking from memory, he thought at that time last year they had well over 100,000 tons of coke in stock; but he doubted if the Company had now more than 24,000 or 25,000 tons, which was, of course, very little. The average consumption of gas was about 15,500 cubic feet through each prepayment meter. This showed the extent to which consumers availed themselves of the system. It was the means of cooking, lighting, and heating practically in many homes. They could cook a dinner for about 2d. It was almost essential in putting up working-class flats nowadays to instal a supply of gas. He had been told that one really could not let flats unless they were carcassed for gas. So that anything serious in the way of a rise in the price of gas and coke would be quite as detrimental as a rise in the price of coal. He had heard dreadful tales of short stocks on the South Coast. Unfortunately, oil would also be a difficulty, because the Government had taken up so many oil-ships, which was almost certain to affect freights. Oil had been coming in freely, and was cheap in itself.

The CHAIRMAN: Can you tell me the prices you are paying at the pit-head for gas coal?

*Witness:* With regard to the prices of coal to-day, for second-class coal, f.o.b. on the Tyne, it would be 14s.

But I mean what you are paying now for existing contracts?—To-day it would be 11s. This would be a fair price, f.o.b. in the Tyne.

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Mr. Milne Watson was re-called and further examined on March 8, when the Chairman stated that the Committee had felt obliged to ask him to come and see them again in a new capacity. They wished to learn something more about the London Coal Advisory Committee.

In the course of his explanation, witness said the Committee consisted, as a Committee, of six firms and interests; and there was an additional Committee who represented a larger group of firms and interests. The small Committee might be called the Executive Committee, and the large one a Consultative Committee. The small Committee was the only one which really met. It was appointed on Jan. 14. There was a meeting at the Gas Light and Coke Company's offices, at the instigation of the Overseas Prize Committee, who suggested that a Committee of the London Public Utility Companies should be formed. The six Companies and interests elected consisted of the Gas Light and Coke Company, the South Metropolitan Gas Company, and four firms of coal factors—Stephenson Clarke's, Cory's, Gardner, Locket, and Hinton's, and Hudson's. The idea was that they should assist in the

allocation of the interned steamers. The six representatives mentioned were elected by a meeting at which there were present a large number of people on behalf of gas companies, electricity companies, and others, as being representative of all their interests. It did not seem to witness a fair thing that six people should take the whole responsibility; and so he suggested that all present at the meeting should form themselves into a Consultative Committee, who would, if they thought they were not being fairly dealt with, have the power of calling a meeting and asking for an explanation from the six representatives. The small Committee were meeting once a week; and he thought the arrangement was working fairly well. The use of the interned steamers had materially helped; but there were not enough of them, and the freights charged for the coal brought in them had been very high.

The CHAIRMAN: It has been suggested to us that if you use these interned vessels, fixing lower freights, you may frighten away to other quarters some of the tonnage which is available now?

*Witness:* I do not think you would frighten it away, because there are not enough of these boats to go round. The result is you are bound to have a certain demand for outside tonnage, notwithstanding the presence of these interned boats; and the freight for this outside tonnage largely depends upon the necessities of London. Public utility companies are not the only people who want coal in London. There may have been some doubt when the interned boats started running as to the effect of differentiating to a certain extent between the freights charged for these boats and the market freights of the day. Since these interned boats have been running at freights which have never, I think, been higher than 13s., freights for outside tonnage have been up to 15s.; and I have been told there was a boat fixed as high as 17s. 6d. This shows that the outside boat could still come in profitably to this trade and do business, and it had not evidently the effect of necessarily frightening them away.

Is it conceivable, to follow your argument, that if, instead of charging 13s., you went down to 10s., even then you would not frighten boats away?—I do not think it would.

Answering further questions, witness explained that the London trade was being done practically by what contract boats were left, and the interned boats, *plus* an occasional outside cargo. But the loss of the outside cargoes did not seem to him to matter much, because one could always get boats. A boat would come, if it was offered a price. He did not think that by the lowering of the freights on the interned boats one would prevent an outside boat being chartered from the Tyne to London. The tendency would be to pull down their freights. The object of the Admiralty Coasting Trade Organization, appointed to deal with the matter, and the London Coal Supply Advisory Committee was to prevent any leakage through to private hands of coal coming under the special arrangement of boats referred to. The Government asked for a return as to where the coal went, so as to enable them to have a check. What the Advisory Committee had asked for was that they should have the interned boats at 5s. per ton. They argued that this would give an ample margin of profit, covering all the extra risks. The ground for asking this was that the boats running in the public interest of London had been taken away by the Government. In one case no less than twelve out of thirteen boats of a certain owner were taken away; and he was paid for them on the basis of something like 4s. Having taken away boats running at 3s. a ton, and paid 4s. for them, the Government gave in return a much worse article—because the interned boats were much worse—and proposed to charge the market rate of the day, which varied from 11s. to 13s. The loss naturally fell on the gas and electricity companies, because the freight owners simply could not stand it.

The CHAIRMAN: You are practically paying 10s. a ton over what you had bargained to pay when you made your contract?

*Witness:* Yes.

And some Committee of the Government are pocketing the balance?—They are pocketing the balance.

Supposing the freights could be got down more to your figure, and you were able to get coal in at 5s. instead of 13s. or 14s. a ton, what would be the position of the London consumer as regards gas. Would he get a reduction?—It would go to his advantage.

Could you give us, to the best of your knowledge, what the position of the London gas consumer will be if things still go on as they are. That is to say, later on when your old contracts have expired, and you are tied down to the present standard of prices?—It is a very easy sum. If these freights are going to rule, and be the basis of contracts for freights, 13s. would mean a 10d. rise in the price of gas. I do not want to mislead you to the extent that all this would naturally have to be incurred. The Company have one ship of their own already, and have taken steps to buy other ships at a great sacrifice, because now it is a very unattractive proposition to buy ships. Second-hand ships are selling at a bigger price than new ships could be built for before the war. But still it does limit the amount you would have to lose on freights, because you can still buy second-hand ships and run them at very much cheaper rates than 10s. To show what enormous profits could be made, you could buy an old ship, and it would have paid for itself in one year at those rates. You may take it from me that the contracts for coal will be up 3s. above last year. That means 3d. on the price of gas. If you put freights on the top of that, you have got a big thing.

Professor ASHLEY: The amount the interned ships can carry is comparatively small; and if they could carry the coal at comparatively low freights, it might be difficult to divide these cargoes among all the public utility companies who would like to benefit by the cheap coal?

*Witness:* You would have to deal with it proportionately.

Mr. DENT: What guarantee is there that the Committee, of which the majority are coal contractors, are not deliberately fixing the freightage of the interned steamers for the purpose of increased profits?

*Witness:* For the reason that we practically know the destination of almost every cargo of coal that is carried by the interned steamers. I could see a possible difficulty of this kind; and I have been very keen on the Admiralty Coasting Office insisting on the filling-up of returns each week showing what coal has been received by these interned steamers, so that they could check automatically the deliveries from these firms of contractors.

Mr. MACHIN: I have every sympathy with the contractors; but it seems to me that the interned ships are going to relieve some of these gentlemen from their responsibilities?

*Witness:* I do not think they are. The question, of course, is, On whose back is the incidence of this extra cost ultimately going to fall? It is bound to fall to a large extent on the consumer. I do not suppose there is any company hoping to deal with the contractors on this hard-and-fast line: "You must deliver this coal, and you must make up the tonnage which you have lost."

Mr. MACHIN: I, unfortunately, have had experience of these very cases in the Courts; and the Courts uphold it. We have been told by many witnesses that they are insisting on their contracts being carried out where colliery proprietors have claimed to be released; and the contracts are being carried out. It is a question of degree.

Mr. BOYTON: Are the Admiralty in charging 13s. charging the maximum?

*Witness:* No. They are charging about 1s. 6d. below what has been done outside at the present time. That is to say, when they were charging 11s., outside boats were being done from 12s. 6d. to 13s.

You have a grievance against the Government for charging 13s., which in itself is not the actual maximum. Is the main object of the Government to help the utility companies?—As far as I know, what brought it about was that we got very short of coal in December; and we did not see how we were going to get coal to London at all. The Governor of the Company, Sir Corbet Woodall, wrote to Lord Fisher and pointed out that there was a very serious state of things, and asked him if it were possible to release some of the commandeered boats, if only for a very short time, or do something in that way to help us. Lord Fisher replied that the Admiralty could not see their way to release any boats, but that they were considering the question of certain interned boats; and almost immediately following this came the invitation of the Overseas Prize Committee to a meeting at the Colonial Office, which they summoned to inquire into the whole case. The boats were put in really at the request of the London Gas Companies, to help them in the serious position when they could not get coal by any means to London.

If you have to base your contracts on the present rate of freights, we may be faced with a 10d. or 1s. increase in the price of gas?—We might be.

Replying to questions by Mr. CROOKS, witness said the freights for the interned steamers were fixed in the North. There were two gentlemen there who had been appointed to manage the boats; and they acted just as any charterers or freighting agents would. This was not what was expected when the interned ships were taken over. He would be very glad to see more interned ships put on. It would help to get prices down.

Mr. CROOKS: Supposing we are fixing a freight at 5s. or 4s., would the Government be equally right in fixing the sale price of coal at the same time?

*Witness:* The difference between the two is that the coal does not at present belong to the Government. For practical purposes, the interned ships do.

Mr. FLUX: Has it occurred to you that, in the case of such a Company as your own, if any saving that might be made through the Government reducing the freights for interned ships were applied wholly to lowering the price of gas, and that was not linked-up with the rate of dividend paid, the situation would be different?

*Witness:* No. I think at the present moment you have got, under our sliding-scale, an ideal way of getting what you want.

My point is that if, through getting these ships cheaper, you are able to avoid putting 2d., 3d., or 4d. on to the price of gas, you would also at the same time avoid reducing your dividend. That is to say, it would be a benefit to your shareholders, as shareholders, through that. Not merely the consumers of London, but the shareholders of the Gas Light and Coke Company would gain. So that while an appeal might be made to the Government on behalf of the consumers as a body, anything in the way of offering ships at a price distinctly below the current market could not benefit the consumers without benefiting the shareholders?—No, to the small extent that the shareholders do benefit by the dividend.

Then there are two questions come up. Why should the shareholders of the Gas Light and Coke Company be benefited, whereas the shareholders of a milling company that might require the services of a ship to bring grain from some foreign port in order to serve the public of London, should not gain; and why should the consumers of gas in London benefit rather than the consumers of something else in Manchester, or some other part of the kingdom?—First of all, a gas company's business is rather different from an ordinary coal merchant's business, or any other kind of business. That is to say, it is physically different. If anyone starts a business as a coal merchant, and he cannot get any coal, it does not matter to him very much, because he can put up his shutters, and there is an end of it. With regard to our coke, if we have none there is none to be sold. With gas it is a different thing. We are under a statutory obligation to supply it. We must supply gas, whether we like it or no. Anybody comes and takes our gas from us.

That answers my point, because it means that whatever expense you have got to meet you are under a statutory liability to meet these expenses, even though it cuts your dividend down to nothing. It rather adds force to what I was going to put to you, that while the service of the poorer gas users might appeal powerfully for the use of these ships, this is linked-up with maintaining a dividend to shareholders who have undertaken as a body a certain liability, whether it pays them or it does not pay them. If the one could be separated from the other, the case might perhaps be clear?—I quite see what is in your mind. With regard to the shareholders, it is a comparatively small interest in the matter; and, moreover, if you did anything to strike at the sliding-scale, you would be doing a great deal of harm to gas companies and, incidentally, to the public, because we get our money very cheaply on the basis of the sliding-scale. We can serve the gas consumers well by raising capital cheaply and economically. The sliding-scale is a splendid automatic balance between the two sides, the consumer and the shareholder. I, for one, should regret very much to see the sliding-scale altered. It has been considered by Parliament over and over again; and it does work wonderfully well in securing a fair balance

between the interests. When you consider that it is only one-seventh, and 1d. in the price of gas means about £112,000 to the consumer, and only 2s. 8d. per cent. to the shareholder, then the latter's share is very small. The aggregate to the shareholders is £20,000. The consumers' interests are so much larger in effect, that they are naturally the governing consideration with regard to the present situation.

After replying to a few more questions, the witness withdrew.

## MANCHESTER CORPORATION GAS UNDERTAKING.

### Annual Report.

We have received from the Superintendent of the City of Manchester Gas Department (Mr. F. A. Price) the report and accounts of the Gas Committee for the year ending March 31. The principal portions of the report, which bears the signature of Mr. Alderman Kay, J.P., the Chairman of the Committee, are given below.

#### Financial.

The expenditure on capital account during the year amounted to £37,944. Of this sum, £10,454 has been provided out of net profits and the balance out of loans. The total capital outlay at March 31, 1915, was £3,043,769, the loan debt in respect of which was £1,002,099. The balance of sinking fund not actually applied to the redemption of debt at the same date was £20,482.

The following is a summary of the items of income and expenditure; the figures for the previous year being given for comparison:—

*Income.*

| 1914. | | 1915. |
|---|---|---|
| £580,920 | Gas, &c. | £585,985 |
| | Residuals— | |
| 114,858 | Coke | 102,318 |
| 49,831 | Tar | 30,848 |
| 44,222 | Ammoniacal liquor and sulphate of ammonia | 37,310 |
| 702 | Sundry receipts | 706 |
| £790,533 | | £757,167 |

*Expenditure.*

| | | |
|---|---|---|
| | Manufacture— | |
| £331,841 | Coal, cannel, and oil | £333,353 |
| 114,031 | Carbonizing wages, maintenance of plant, &c. | 113,252 |
| 21,962 | Renewals | 21,994 |
| | Distribution— | |
| 59,264 | Maintenance of plant, salaries and wages, &c. | 54,930 |
| 40,044 | Renewals | 41,964 |
| 67,835 | Rents, rates, and taxes | 58,176 |
| | Management, collection, &c.— | |
| 22,917 | Salaries and wages (*Less* received from Electricity Committee for collection of accounts, £1999) | 22,502 |
| — | War service allowances | 7,815 |
| 14,691 | Other charges | 14,393 |
| £670,693 | | £666,380 |
| £119,840 | Showing a gross profit for the year of | £90,787 |
| 38,714 | From which has to be deducted the amount paid for interest on loans, &c. | 39,628 |
| £81,126 | Leaving a net profit of | £51,159 |

The net profit, together with £23,597 14s. 8d. the balance of the reserve funds, making a total sum of £74,756 15s. 11d., has been appropriated as follows, the excess appropriation of £52,708 5s. 6d. being carried forward to next year's account:

| 1914. | | 1915. |
|---|---|---|
| £63,722 | Sinking fund for redemption of loan debt | £67,011 |
| 52,090 | City fund in aid of rates | 50,000 |
| 6,065 | Applied in extension of works where borrowing powers are not granted | 10,454 |
| Provision 14 | Premiums, &c., on purchase of 4 per cent. stock for cancellation | .. |
| £121,891 | | £127,465 |

The quantity of gas sold was 5,881,103,000 cubic feet, an increase of 1·90 per cent. on the corresponding figures for the previous year; and the average price realized was 1s. 11·74d. per 1000 cubic feet. The extension of the graduated scale of charges to meet the case of consumers taking over 1 million cubic feet per quarter, referred to in last year's report, represented further concessions to consumers of the value of £6500. The cost of coal and oil per ton carbonized was 12s. 6·94d., as against 12s. 6·03d. for the previous year; while the income from residual products fell to 6s. 5·19d. per ton, compared with 7s. 10·45d. —representing an increase of 1s. 6·17d. per ton in the net cost of raw material, which, on the total carbonization of 530,042 tons, amounts to £40,128.

The amount transferred from revenue to the credit of the renewals account is £65,241, which, together with the interest on the fund, makes a total credit for the year of £69,588. The sum of £68,800 has been expended during the year. The balance to the credit of the account is now £145,704.

The balance of the general reserve fund, after meeting certain payments in connection with the war, and the amount standing to the credit of the consolidated stock premium reserve account, amounting together to the sum of £23,597, have been transferred to the credit of the net profit appropriation account.

#### European War.

With a view to supplementing the efforts of the citizens of Manchester, the Committee proposed on Aug. 28, 1914, and the City Council approved, that £7000 be paid out of the reserve fund towards the equipment of the Manchester Battalions, and £3000 from the same source towards the Lord Mayor's Local Fund. At March 31, 502 employees of the department had joined His Majesty's forces, representing 58 per cent. of the employees who were eligible on Aug. 4, 1914. The estimated war service allowances payable under the Council's resolution of Oct. 7, including the Street Lighting Department, will amount to £21,000 per annum. The employees of the Committee have requested to be allowed to place in the general office of the department, at their expense, a permanent record of the names of those employees who have joined the Imperial forces.

In accordance with the resolution of the Committee of Jan. 22, gas is being supplied to 69 Belgian hostels and 13 Red Cross and voluntary military hospitals at one-half the usual price. The concession will amount to about £400 per annum.

#### Restriction of Lighting Order.

The restriction of street lighting which came into operation on Feb. 8 has had an adverse effect on the consumption of gas. To March 31, the decrease due to this cause is estimated at 30 million cubic feet. Under similar conditions, the reduction during the current year will be about 290 million cubic feet, which is equal to 5 per cent. of last year's total sales.

#### War Bonus.

The men working 8-hour shifts have been granted a war bonus of 4d. per shift, and all other men 2s. per week, except foremen and tradesmen, who have been advanced according to their respective trade rates. The bonus dates as from April 1 last, and the annual cost is estimated at £8000.

#### British Commercial Gas Association.

By resolution of Oct. 30, 1914, the Committee decided to continue, for a further period of three years, their subscription, on the basis of 2s. 6d. per million cubic feet of gas made, to the funds of the British Commercial Gas Association. The propaganda work of the Association is proving most beneficial to the development of the gas industry, and is well worthy of financial support by all undertakings.

#### Price of Gas.

Owing to the increase in the price of coal and oil, the reduction in the value of residuals, the war allowances and bonus, and the increased cost of stores, &c., the Committee have been reluctantly compelled to recommend an advance of 6d. per 1000 cubic feet in the price of gas to all consumers. The recommendation was approved by the City Council, and the new scale of charges will take effect as from June 24 as follows:—

| Gas Consumed on One Premises per Quarter. | Within the City. Per 1000 c.f. | Without the City. Per 1000 c.f. |
|---|---|---|
| | s. d. | s. d. |
| Ordinary consumers— | | |
| Under 250,000 cubic feet | 2 8 | 2 11 |
| 250,000 and under 1 million | 2 7 | 2 10 |
| 1 million and under 2 millions | 2 6 | 2 9 |
| 2 millions ,, 3 ,, | 2 5 | 2 8 |
| 3 ,, ,, 4 ,, | 2 4 | 2 7 |
| 4 ,, ,, 5 ,, | 2 3 | 2 6 |
| 5 ,, and upwards | 2 2 | 2 5 |
| Gas-engines— | | |
| Under 1 million cubic feet | 2 3 | 2 6 |
| 1 million and under 2 millions | 2 2 | 2 5 |
| 2 millions and upwards | 2 1 | 2 4 |
| [These prices are subject to a discount of 2d. per 1000 cubic feet for payment within one month.] | | |
| Public street lamps [net] | 2 0 | 2 3 |
| Automatic consumers— | | |
| Cubic feet per penny [net] | 30 | 28 |

#### Extension and Renewal of Works.

*Gaythorn Station.*—At these works a new section of washing and scrubbing plant has been installed, consisting of a Livesey washer and vertical centrifugal washer, each of a capacity of 5 million cubic feet per diem. Gas-compressing plant in duplicate, of a capacity of 20,000 cubic feet per hour, for the supply of high-pressure gas for street lighting and private consumers, has been erected at this station. One set is driven by a gas-engine and the other by an electric motor, so that an uninterrupted supply is assured to the consumers.

*Rochdale Road.*—The first section of the vertical retort installation was put to work on June 24, and the second section on Oct. 28. The results so far obtained in the quantity of gas, coke, tar, and ammoniacal liquor produced per ton of coal have been very satisfactory, and stoppages from naphthalene in the district supplied from these works considerably reduced. No. 6 gasholder at Newtown has been entirely reconstructed during the year.

*Bradford Road Station.*—A new road has been constructed adjoining No. 6 gasholder, separated by a retaining and boundary wall from the gasholder yard; and this will eventually be the principal entrance to the works. A house to contain the valves operating No. 6 gasholder has been erected adjacent thereto. Three dwelling-houses to accommodate the staff controlling the production of gas at this station during the day and night have been built on the land belonging to the Committee in Bradford Road. Washing plant for recovering the coke from the ashes and clinker from the coal gas and carburetted water-gas producers has been installed and is effecting considerable economy. Work in connection with the extension of the railway sidings, &c., and the construction of the retaining wall to the railway embankment was commenced during the year.

*Droylsden Station.*—The No. 2 vertical retort-setting at these works was rebuilt during the year, after being at work during the greater part of the period from October, 1910, to September, 1914. No. 1 setting is still working satisfactorily. A new exhauster of a capacity of 30,000 cubic feet per hour has been installed.

*Chemical-Works.*—Extensions to the sulphuric acid chambers have

been carried out during the year, which will considerably increase the output of the plant.

PRIVATE LIGHTING DEPARTMENT.

Despite the adverse influence of the Restriction of Lighting Order, the private lighting department has made satisfactory progress during the year. There are 359 private high-pressure lamps and 293 high-power low-pressure lamps fixed and maintained by the department. High-pressure gas is also being extensively used with great success for inside lighting and heating purposes.

There are 473 consumers who have taken advantage of the burner maintenance system; and they appreciate the marked increased lighting efficiency thus obtained.

STATISTICAL.

The following particulars are furnished as illustrating the growth and working of the department during the year :—

| — | Year 1914. | Year 1915. | Increase. |
|---|---|---|---|
| | | | Per Cent. |
| MANUFACTURE— | | | |
| Material carbonized—tons. | 530,840 | 530,042 | — |
| Gas made—Thousands cub. ft. | 6,130,677 | 6,232,967 | 1·67 |
| ,, per ton—cub. ft. | 11,549 | 11,759 | — |
| Illuminating power as tested by "Metropolitan" No. 2 burner—candles | 16·51 | 15·87 | — |
| Calorific value, B.Th.U. | 581 | 567 | — |
| DISTRIBUTION— | | | |
| Output of gas—Thousands cub. ft. | 6,130,358 | 6,237,403 | 1·75 |
| Gas sold ,, ,, ,, | 5,771,415 | 5,881,103 | 1·90 |
| Gas unaccounted for (adjusted) ,, ,, | 209,204 | 203,027 | — |
| ,, ,, ,, per cent. on output | 3·41 | 3·25 | — |
| Total number of consumers (including automatic) | 187,870 | 189,201 | 0·71 |
| Number of automatic consumers | 70,420 | 72,202 | 2·53 |
| Gas sold to automatic consumers—Thousands cub. ft. | 869,065 | 965,388 | 11·08 |
| Gas cookers and fires :— | | | |
| Number fixed and owned by Committee— | | | |
| Cookers | 72,993 | 80,333 | 10·06 |
| Grillers | 34,489 | 36,966 | 7·18 |
| Fires | 12,308 | 17,083 | 38 80 |
| | 119,790 | 134,382 | 12·18 |
| Gas consumed (estimated)— | | | |
| Cookers and grillers—Thousands cub. ft. | 942,500 | 1,016,500 | 7·85 |
| Fires—Thousands cub. ft. | 120,000 | 185,000 | 54·17 |
| Per cent. of consumers having free use of cooker or griller | 57 | 62 | — |
| Mains— | | | |
| Total length of mains laid, including high-pressure mains—miles | 975¾ | 988¼ | — |
| Public lamps— | | | |
| Within the city | 21,232 | 21,427 | — |
| Without the city | 1,372 | 1,420 | — |
| | 22,604 | 22,847 | — |

## SMETHWICK GAS UNDERTAKING.

It was stated last week that, for the financial year ended March 31, there was a net profit on the working of the Smethwick gas undertaking of £5511, from which has been provided a contribution to public lighting and the district rate of £4173, and to the Free Library Committee of £50, leaving a surplus of £1288 to be carried to depreciation and extension fund account. Further particulars of the financial, as well as the working, results are now available, in the report of the Secretary (Mr. W. J. Sturges) to the Chairman and members of the Gas Committee.

From this, it appears that the total income for the year from all sources on revenue account amounted to £80,535, compared with £80,154 for the previous year. The net sales of gas amounted to £60,458, an increase of £2227 over the previous year. The total quantity of gas sold and accounted for was 563,470,600 cubic feet, which compared with the previous year shows an increase of 14 702,700 cubic feet, or 2·68 per cent. The gas sold through prepayment meters increased 8·83 per cent. Sales for power and manufacturing purposes show a decrease of 4·46 per cent , and public lighting a decrease of 9·35 per cent. The quantity of gas unaccounted-for, due to leakage, condensation, &c., was 34,485,900 cubic feet, or 5·77 per cent. of the gas sent out, as against 5·71 per cent. in the previous year. The amount collected from prepayment meters during the year averaged 45s. 10½d. per meter, with an average consumption of gas per meter of 16,513 cubic feet, an increase of 2s. 7d., or 924 cubic feet, per meter. The number of meters fixed at the end of the year was: Ordinary, 4000; prepayment, 10,446. The number of cooking-stoves fixed on hire was 4490, and of grillers fixed free of charge to prepayment consumers 5415.

There was a decrease of £1693 in the amount of income arising out of the sales of residual products; the total amount realized from this source being £19,750, against £21,444 for the previous year. On coke (which shows a decrease of £1306), while the quantity sold was more than last year, the average price realized was 1s. 4d. per ton less, and the increased cost of haulage and labour charges together accounted for a further loss of 10d. per ton.

The total expenditure on revenue account was £63,311, or an increase of £1872. On manufacture of gas (including maintenance and renewals of works and plant) there is an increase of £2631, owing principally to the increased cost of coal (equal to 8½d. per ton) and heavier expenditure in repairs. The net cost of manufacture (after deducting the value of residual products) works out at 1s. 0 834d. per 1000 cubic feet of gas sold, compared with 11·286d. for the previous year. The total value of the public lighting (including 30,531,500 cubic feet of gas at 1s. 8d. per 1000 feet, *plus* maintenance expenses) contributed free of charge in aid of the district rate was £4173. The number of public lamps in use at the end of the year was 1330. There is an additional charge on this occasion of £382 for war allowances. The total wages bill for the year amounted to £18,472, as against £17,860.

The gross profit on the year's trading is £17,224, as compared with £18,715. The profit and loss account shows a credit balance of £7108 brought forward from the previous year's account; and to this has been added the gross profit of £17,224. Against this has been charged the necessary provision for interest on loans and redemption and extinction of debt, amounting in the aggregate to £11,712, leaving a net profit for the year, as already stated, of £5511, compared with £7735, a decrease of £2224. After providing the contributions agreed upon, the balance of £1288 has been transferred to the credit of the depreciation and extensions fund account. Further expenditure during the year, amounting in the aggregate to £2214, has been charged to this account, which, after crediting the balance of net profit of £1288, shows an adverse balance of £7099 to be liquidated out of revenue.

## REINSTATEMENT OF PIPE-TRENCHES.

### The Costs in the Metropolitan Water Board Area.

At the Metropolitan Water Board's meeting last Friday, the Works and Stores Committee submitted a schedule of prices in respect to the reinstatement of pipe-trenches opened by the Board in certain of the Metropolitan districts; and they were agreed to.

HACKNEY BOROUGH COUNCIL.

| | | |
|---|---|---|
| Tar paving | per super yard | 3s. 0d. |
| ,, macadam | ,, ,, | 7 0 |
| Asphalte | ,, ,, | 6 6 |
| ,, roadway | ,, ,, | 12 0 |

ACTON URBAN DISTRICT COUNCIL.

| | | |
|---|---|---|
| New blue-brick paving | per square yard | 5s. 9d. |

FINSBURY BOROUGH COUNCIL.

*Footway paved by Val de Travers—*

Mastic asphalte, at per yard super, 1-inch thick :

| | |
|---|---|
| Up to and including 5 yards super | 5s. 0d. |
| Above 5 yards up to and including 10 yards | 5 0 |
| ,, 10 ,, ,, ,, 20 ,, | 4 6 |
| ,, 20 ,, ,, ,, 50 ,, | 4 3 |
| ,, 50 ,, ,, ,, 100 ,, | 4 0 |

Concrete by Council at 18s. per cubic yard.
Footway nearly always on 4-inch concrete.
Nothing less than 1 yard.

*Asphalte Roadway Paved by Val de Travers, Limmer, or French, whichever is Nearest the Opening.*

Compressed asphalte at per yard super.

| | 1-inch thick. | 1½-inches thick. | 2-inches thick. |
|---|---|---|---|
| Up to and including 5 yards super | 7s. 0d. | 10s. 6d. | 13s. 0d. |
| Above 5 yards up to and including 10 yards | 6 6 | 10 0 | 12 6 |
| ,, 10 ,, ,, ,, 20 ,, | 6 6 | 8 6 | 12 0 |
| ,, 20 ,, ,, ,, 50 ,, | 6 0 | 8 0 | 11 0 |
| ,, 50 ,, ,, ,, 100 ,, | 6 0 | 8 0 | 10 0 |

Concrete by Council at 18s. per cube yard.
Nothing less than 1 yard.

HENDON URBAN DISTRICT COUNCIL.

| | | |
|---|---|---|
| Wood and concrete | per yard super | 19s. 0d. |
| Wood only | ,, ,, | 11 6 |
| Concrete only | ,, ,, | 7 6 |
| Relaying setts on 6-inch concrete | ,, ,, | 6 0 |
| ,, ,, 9-inch concrete | ,, ,, | 7 6 |
| ,, ,, 12-inch concrete | ,, ,, | 9 0 |
| Brick paving | ,, ,, | 4 0 |

WOODFORD URBAN DISTRICT COUNCIL.

| | | |
|---|---|---|
| Trinidad asphalte and bituvia | per super yard | 15s. 0d. |

EAST HAM CORPORATION.

| | | |
|---|---|---|
| Asphalte macadam | per square yard | 6s. 6d. |
| Pitchings relaid on 9-inch concrete | ,, ,, | 8 6 |
| Concrete | per cubic yard | 20 0 |
| Channelling relaid | per yard run | 1 10 |
| Tar macadam, with topping | per yard super | 5 0 |

ILFORD URBAN DISTRICT COUNCIL.

| | | |
|---|---|---|
| Asphalte | per yard super | 3s. 0d. |
| Tar paving | ,, ,, | 3 0 |

CAMBERWELL BOROUGH COUNCIL.

| | | |
|---|---|---|
| Tar macadam | per yard super | 4s. 6d. |

ST. PANCRAS BOROUGH COUNCIL.

| | | |
|---|---|---|
| Tar-sprayed macadam | per yard super | 3s. 0d. |
| New wood blocks | | cost price. |

**Rise in Price at Sleaford.**—The Sleaford Gas Company, Limited, intimate that, from July 1, the price of gas will be increased 2d. per 1000 cubic feet.

**Gas Prices at Ilkeston.**—It having been suggested at a recent meeting of the Ilkeston Town Council that the proposed increase in the price of gas by 6d. per 1000 feet should be reconsidered, the Committee have again had the matter under discussion, with the result that no ground has been found for altering the recommendation.

## ILLUMINATING ENGINEERING SOCIETY.

### Report of the Council for the Past Session.

The June number of the "Illuminating Engineer" contains the text of the report of the Council of the Illuminating Engineering Society, as presented and adopted at the annual meeting on the 18th ult., on the motion of Mr. F. W. Goodenough (the Chairman of the Council), seconded by Mr. A. P. Trotter.

The Council pointed out that the report appeared in circumstances very different from those existing at the end of the previous session. At that time everything pointed to an active resumption of work in the autumn under the most favourable of conditions. The international side of the movement had assumed definite shape through the formation of the International Commission on Illumination. The Society in the United States and the newly-formed Society in Germany were actively carrying on their work; and in France and Belgium the movement was also making steady progress. Active steps were being taken for the extension of the work of the Society throughout the United Kingdom; and the official organ of the Society for August contained a special summary, giving the aims and the work so far performed by the Society. It was intended to send out this number with a view to enlarging the membership of the Society, and increasing its scope of operations. Scarcely had the issue appeared, however, when the war began. International co-operation was brought to a standstill; and it became evident that the proposed widespread effort to arouse interest in the movement would have to be postponed. Nevertheless it was felt to be essential to maintain the continuity of work of the Society as far as possible; and it was hoped that the present exceptional circumstances, while checking the activities of the Society in some directions, would provide opportunities for useful work in others – light being necessary in all times, alike in peace and in war.

#### Members Engaged in War Work.

The carrying out of the usual programme of the Society presented difficulties. Many of the younger members joined the forces; others have been engaged in special professional work for the Government. The President, for example, has been very fully occupied in medical work in connection with the war. Other members have been necessarily immersed in extra labours caused by the withdrawal of so many men from their ordinary occupations, and the dislocation of business conditions generally. A considerable proportion of the members of the Society have been engaged in the important duty of maintaining the supply of gas and electricity; and the exceptional demands of factories engaged in preparing munitions of war on the one hand, and the unusual requirements as regards diminution in public lighting on the other, have added to their responsibilities throughout a difficult period. Members interested in acetylene, incandescent oil, and similar portable systems of lighting have been very busily engaged in Government work. Many members also have undertaken new responsibilities as special constables or in connection with volunteer corps.

#### Membership Maintained.

In the circumstances it was also natural that there should have been a certain number of resignations, and a considerable increase in membership during the year could scarcely have been anticipated. The Council are glad to say, however, that the present number of members stands at a figure slightly above that prevailing at the commencement of the war. All things considered, the Society may congratulate itself on this result under such unfavourable conditions.

During the session, Sir Corbet Woodall and Mr. Thomas Alva Edison accepted nomination as Honorary Members of the Society; and, in accordance with the arrangement made with the Institutions of Gas and Electrical Engineers last year, the Presidents of these two bodies (Mr. Bond and Sir John Snell) were invited to act upon the Council of the Society.

At the commencement of the session the question arose whether the ordinary programme could be carried out; and, in view of the many important applications of light illustrated by recent events, it was decided to hold regular monthly meetings, but to select, as far as possible, subjects for discussion which would be of special interest at the present time.

#### Meetings of the Society.

Five meetings (not including the annual general meeting) were held. At the opening meeting (Dec. 1) there was a general discussion on "Illuminating Engineering in War Time." Some of the problems arising through the war were considered, with reference to the alterations in outdoor lighting that have been made as a measure of precaution against hostile aircraft. It was pointed out that the methods of concealed window-lighting recommended at previous meetings of the Society, and the avoidance of glaring sources were best adapted to comply with the requirements made by the authorities.

In this discussion, it was considered expedient to avoid any detailed comment on, or criticism of, the alterations in public lighting made since the commencement of the war; the aim of the Society being simply to assist its members and the public in complying loyally with any steps taken by the authorities in the interests of public safety.

The framing and carrying out of general regulations for the lighting of shop-windows and streets in war time, undertaken at short notice, was a difficult task; and, not unnaturally, the regulations were interpreted somewhat differently in various districts. So it was thought the Illuminating Engineering Society, whose members were accustomed to the consideration of such matters, might be of service. Accordingly, a Committee, including some members of the Society who were also members of the Anti-Aircraft Corps, was formed with a view to making some definite recommendations on shop-window lighting, which would enable the requirements of the authorities to be satisfactorily fulfilled. After several meetings, suggestions were prepared and submitted to

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**WORKS:** Gothic Works, EDMONTON, N. Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.
**SHOW-ROOMS AND BRANCHES:** 25, Princes Street, Oxford Circus, W.; 136, Renfield Street, GLASGOW; 56, Broad Street, BIRMINGHAM; 83, Old Market Street, BRISTOL; 18, Severn Street, Deansgate, MANCHESTER; 97, Millfield, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

the authorities, by whom they were sympathetically received and considered.

In view of the great changes made in public lighting since the war began, the Council thought that a record of these conditions might with advantage be kept, by means of photographs and measurements of the conditions of illumination prevailing in the streets of London. Permission has been granted to the Hon. Secretary for this to be done, on the understanding that none of the data should be published until the conclusion of the war. It is hoped that when that time arrives some interesting data will be available; and it is probable that some useful lessons may be learned from the exceptional lighting conditions now prevailing, which will not be without influence on the methods of illumination to be adopted in the future.

The second meeting of the Society (Jan. 19) was again devoted to a subject of considerable topical interest—the "Scientific Development and Practical Applications of Searchlights." In the discussion it was considered essential to avoid any reference to the arrangements made for home defence; and there were many matters it was deemed inexpedient to mention at present. Notwithstanding these limitations, however, the discussion was regarded as an important contribution to the knowledge of the subject—many problems of more than ordinary interest being suggested.

In view of the restrictions on public lighting, it was thought that a paper dealing with some aspect of interior illumination would be appreciated. Accordingly, at the following meeting (Feb. 16) a paper was read by Mr. F. W. Thorpe, on the "Development of Fixture Design in Relation to Architecture, Illumination, and Interior Decoration." The subject is one of considerable interest to members of the architectural profession, and should be the means of drawing the attention of architects to the work of the Society.

On March 16 there was a discussion on the "Marking and Rating of Lamps and the Best Methods of Specifying their Illuminating Value"—a very important subject both to lamp manufacturers and to the general public.

The succeeding meeting (April 28) was given up to a discussion on "Visibility—Its Practical Aspects." The discussion was in several respects supplementary to that on "Searchlights," and dealt with many points of considerable interest at the present moment.

The subject of discussion at the final meeting of the session (May 18), "The Lighting of Rifle Ranges," was again one of topical interest. A very large number of these ranges are being constructed at the present time; and in view of the important effect of the conditions of illumination on the convenience of marksmen, a specification of the lighting conditions would be a useful guide to those engaged in their construction.

It will thus be seen that the Council have been able to continue meetings as usual during the session in spite of the difficulties imposed by the war, and, by the selection of suitable subjects, interest has been kept alive. The attendance at meetings has been more than maintained, and the standard in the discussions has been uniformly high. The subjects have also been such as to interest new circles in the work of the Society; and connections have been established which should be helpful in time to come. The interest aroused in the papers during the session has shown the necessity for the platform offered by the Society for the discussion of the many lighting problems awaiting solution.

### International Congresses, Committees, &c.

There is, unfortunately, little to report regarding proceedings of international congresses. The Illuminating Engineering Society in the United States continued its work as usual, and a number of valuable papers were read at its Eighth Annual Convention at Cleveland. The National Illumination Commission in this country has held several meetings, and proposes to carry on its work, although during the war various matters which would otherwise have been actively taken up have necessarily been postponed.

At the present time, when so many factories are working overtime on Government work, the subject of industrial lighting is being given special prominence, and the report of the Departmental Committee appointed in 1913 by the Home Secretary to inquire into the matter is being awaited with considerable interest. The work of the Committee has proceeded steadily since the war commenced; and its report, when issued, is expected to do much to encourage more scientific methods of illumination.

### Additional Support Required.

The position may be summarized by saying that, in spite of the unprecedented conditions arising through the war, the Society has been able to maintain its useful work. It is becoming evident that, in order to make any substantial progress, the Society must either secure a considerably enlarged membership or consider an increase in its present moderate subscription. The Illuminating Engineering Society in the United States, in spite of its vastly greater membership, has experienced similar difficulties, and is now considering a scheme for dividing members into two classes—namely, "members" and "associate members"—paying respectively subscriptions of two guineas and one guinea per annum. The Council consider that additional funds are needed to enable the work of the Society to be carried on in a satisfactory manner; and they desire to emphasize the importance of securing additional members.

### Programme for Next Session.

The Council are now engaged in considering the programme for the next session; and they invite suggestions as to the future work of the Society, or any subjects which might receive special attention during the next session.

---

The report was signed by Sir William H. Bennett, President, Mr. F. W. Goodenough, Chairman of Council, and Mr. Leon Gaster, Hon. Secretary.


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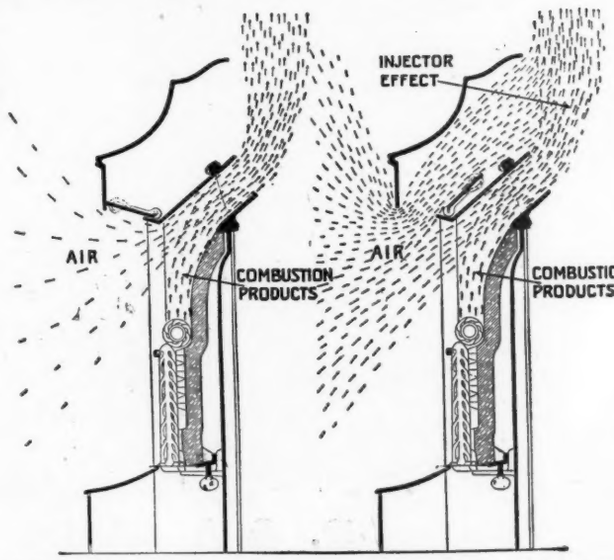


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## QUALITY OF LONDON WATER.

At last Friday's meeting of the Metropolitan Water Board, the eleventh report by Dr. Houston, the Director of Water Examination, was presented, and appears to be not only of scientific interest, but of great practical importance.

The first part of the report deals with the lime experiments at Sunbury, and the Water Examination Committee draw the attention of the Board to the fact that, by adding less than 1 lb. of lime to 500 gallons of raw Thames river water, the following remarkable results were obtained: The water before it left the first tank was greatly improved as regards colour and turbidity; and the total number of bacteria was reduced over 99 per cent. The *B. coli* results were specially worthy of note; for whereas the raw river water before treatment contained *B. coli* in 1 c.c. in 41·2 per cent. of the samples, yet after treatment there were no *B. coli* in 10,000 c.c.

The Director considers that such a water could not conceivably have contained any of the microbes of epidemic water-borne disease—*e.g.*, typhoid fever; and he concludes with the following strong statement:

> ". . . no hesitation is felt in expressing the opinion that river water, *no matter how impure*, may be brought into a condition of *absolute safety bacteriologically*, and of *great relative purity chemically*, by means of lime."

The Committee note with interest that there seems some ground for believing that the lime treatment is effective in dealing with algæ infected waters. They are convinced that lime, when used in slight excess, can render most impure water safe for domestic use. As regards the practicability of the process on a large scale, they endorse the cautious statements made by the Director. There can be no doubt that in the case of very soft waters, sterilization by means of lime is both a satisfactory and an extremely cheap method of purification. In the case of hard waters, the cost is admittedly serious; but, on the other hand, the advantages to the consumer of a soft water are so material, that it is perhaps a debatable question whether the process may not come to be regarded as a financially sound proposition. The whole question, in their opinion, deserves of further investigation.

The second part of the Director's report deals with the critical study of microbes in the London waters which might conceivably be mistaken for true cholera vibrios. There can be no question, they say, that the world-wide war now raging increases very appreciably the risks of epidemic water-borne disease. The Director had previously shown that his methods can detect the presence of cholera vibrios artificially added to water. He now shows that in the absence of cholera infection there are no microbes normally present in the London waters which can pass the mesh of his tests and pose as true vibrios. By his comprehensive study of the "normal," the Director is in a position to discover the "abnormal" should such a contingency ever arise.

## NOTES FROM SCOTLAND.

**From Our Own Correspondents.**

*Saturday.*

Fuller figures which are now available show that the revenue of the Dundee Gas Commissioners for the year ended April 30 amounted to £148,958, compared with £146,718 for the preceding year. On the other side, the expenditure was £123,597, against £121,287. There was thus an amount to be carried to net revenue account of £25,360, compared with £25,430. After meeting capital charges, there is a deficit of £10,037. The quantity of gas delivered was 1,136,942,000 cubic feet; the figure for the previous year having been 1,031,947,000 feet. The capital per million cubic feet of gas delivered stands at £378. As to the unaccounted-for gas, this figures at 4·66 per cent., compared with 8·9 per cent. a year ago. The make of gas per ton of coal carbonized was 11,038 cubic feet.

Tenders are being received at Inverness for an installation of vertical retorts. The report of the Manager (Mr. A. Thomson) on his visit with a Committee to inspect vertical retorts at Hamilton, Greenock, and at the Dawsholm station, Glasgow, was favourably entertained; and the work will be proceeded with as early as possible.

The price of gas at Kirkcaldy is to be raised from 3s. 5d. to 4s. 5d. per 1000 cubic feet.

The Corporation of Glasgow have been found liable by Sheriff Lyell in £30 of damages and expenses in an action brought in the Sheriff Court by Andrew Burnside, in respect of injuries sustained by his son through falling into a trench excavated by the Water Department. On Nov. 18, the servants of the Corporation were repairing a water-pipe, and had dug a trench which reached more than halfway across the footpath on the north side of Argyle Street in front of the Art Galleries. The night was dark and foggy; and between five and six o'clock the labourers came out of the trench and went to dry themselves at a brazier burning in the street. No one, said the Sheriff, was detailed to guard the trench until the arrival of lights. At the sides of the trench there was no protection but a heap of earth a foot high, which was simply a trap for the unwary. There was no light, and no one to warn foot passengers. He considered that defenders' servants were guilty of negligence of the most grievous and palpable kind.

**Higher Gas and Electricity Charges at Dewsbury.**—Owing to the price of coal having been advanced 6s. per ton, involving an extra expenditure of about £10,000 in one year, the Dewsbury Corporation have increased the charges for gas 4d. per 1000 cubic feet, and for electric current have decided to charge an additional 10 per cent. for lighting purposes, 12½ per cent. to rateable value consumers, and 15 per cent. for heating and motive power.


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## CURRENT SALES OF GAS PRODUCTS.

### The London Market for Tar, Tar Products, and Sulphate.

LONDON, *June* 28.

The market remains unaltered so far as prices are concerned. Naphthalenes in all forms are in large demand, as well as solvent naphtha and benzol. Freed tar and pitch for road purposes are being delivered in satisfactory quantities.

There is a marked advance in the value of sulphate of ammonia; sellers being very shy. It is doubtful whether the 25 per cent. quality could be bought at less than £14 5s. per ton net in buyers' bags, *ex* manufacturers' works.

### Tar Products in the Provinces.

*June* 28.

There is very little fresh to report concerning the markets for tar products. Pitch remains steady, and makers are still firm in their idea of value. Solvent naphthas continue in very good demand, and high prices are reported in all quarters. Creosote is quiet, and there appears to be plenty offering. Crude carbolic is firm, and high figures have been paid for both prompt and forward delivery.

The average values of gas-works products during the past week were: Gas-works coal tar, 21s. 6d. to 25s. 6d. Pitch, East Coast, 22s. to 23s. per ton; Norfolk, Suffolk, and Humber ports, 19s. to 20s.; West Coast, 20s. to 21s. Manchester; 21s. to 21s. 6d. Liverpool; 23s. to 24s. Clyde. Benzol, 90 per cent., naked, North, 10¼d. to 11d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 2d. to 2s. 4d. Crude naphtha, in bulk, North, 6d. to 6½d. Solvent naphtha, naked, North, 1s. 10d. to 1s. 11d. Heavy naphtha, naked, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 3d. to 3⅛d. Heavy oils, in bulk, 3⅛d. to 4d. Carbolic acid, casks included, 60 per cent., East and West Coasts, 3s. 4d. to 3s. 6d. Naphthalene, £8 to £16; salts, 75s. to 80s., bags included. Anthracene, "A" quality, 2d. per unit; "B" quality, nominally ¾d.

### Sulphate of Ammonia in the Provinces.

LIVERPOOL, *June* 26.

The tone of the market has become still more vigorous during the past week, and a further substantial rise in values has been recorded at all points. There has been a certain amount of the speculative element in the purchasing, but there has also been a considerable volume of business from direct buyers abroad. Prices have been rather irregular, and the closing quotations are: £14 5s. to £14 7s. 6d. per ton f.o.b. Hull, £14 7s. 6d. to £14 10s. f.o.b. Liverpool, and £14 10s. to £14 12s. 6d. f.o.b. Leith. The rapid advance in the near position has had the effect of deterring many manufacturers from selling forward; but it is reported that contracts have passed for July-December, 1915, and January-June, 1916, at up to £14 12s. 6d. per ton f.o.b. Liverpool, and £14 15s. at Leith.

### Nitrate of Soda.

This market is again a little weaker on spot, and holders have reduced their prices to 12s. per cwt. for 95 per cent. quality, and 12s. 3d. for 96 per cent.

### Sulphate of Ammonia.

From another source it is reported that this market has remained very firm throughout the past week, and improved prices have been paid in all quarters. Outside London, makes are quoted at £13 6s. 3d. to £13 7s. 6d.; Hull, £14 to £14 2s. 6d.; Leith, £14 5s. to £14 7s. 6d.; Liverpool, £14 2s. 6d. to £14 5s.; and Middlesbrough, £14 to £14 2s. 6d.

## COAL TRADE REPORT.

### Northern Coal Trade.

The coal trade is rather steadier—the local holidays having reduced production, and allowed steamers to arrive at the shipping ports. Prices, however, are still rather weak, as the permits to export coal are not very freely given. In the steam coal trade, the price of best Northumbrians is steady at 20s. to 21s. per ton f.o.b., though forward rates are irregular. Second-class steams are from 17s. per ton; and steam smalls are quiet at 14s. to 17s. per ton f.o.b., according to quality. The output seems to be nearer normal, and is on the whole rather more readily taken up; so that if the licences for export were granted more freely, the prospect would be brighter. In the gas coal trade, demand for the best classes is good; but for second sorts, the prices show a little quietness. Best Durham gas coals are steady at 20s. per ton f.o.b.; second class about 18s. to 18s. 6d. per ton; and for "Wear Specials," from 22s. to 22s. 6d. per ton f.o.b. is quoted. Some contracts are on the market for good gas coals, but they do not seem to be readily concluded, as both price and freight are rather uncertain forward. For prompt shipment, gas-coal freights are based on about 7s. 3d. to 7s. 6d., Tyne to London. Deliveries of gas coals are fuller, both to the Metropolis and to French ports; but they can scarcely be said to be up to the average at the end of the half year. Local companies seem to be getting fair supplies of coal, though even in these cases delay is caused by labour shortage in some instances. Coke is firm. Gas coke is less plentiful, and is quoted at higher prices. Good gas coke is from 23s. to 24s. 6d. per ton f.o.b. in the Tyne.

## Mansfield Gas Undertaking.

At the last meeting of the Mansfield Town Council, Mr. Tarachand stated that it had been reported to the Gas Committee that there was a deficiency of £2000 last year upon the working of the department, and he desired to know if this was true. Mr. T. Smith (the Chairman of the Committee) said he was not in a position to give an immediate answer to the question. A full report dealing with the year's work in connection with the undertaking would be placed in the hands of members of the Council within the ensuing month; and if there had been a loss, they might rest assured that the Committee would do their best to find out where and how it had arisen, and let the Council have all the available particulars. Then it would be for them to make any recommendation which they might think fit. The Committee's report recommending, in consequence of the higher price of coal, an increase of 6d. per 1000 cubic feet in the price charged for gas, having been already adopted, Mr. Farmilo, who is one of the leading members of the Notts Miners' Association, expressed the view that the Council should raise a protest against the present high price of coal. Mr. Smith stated that every effort had been made to obtain cheaper coal; but the Committee had failed.

**Suggested Increases Referred Back.**—In introducing the past year's accounts of the gas undertakings at a meeting of the Stoke-on-Trent Federated Council, Alderman Mitchell (the Chairman of the Gas Committee) reported losses on all four works to the total amount of £6779, made up of £1140 at Burslem, £2815 at Stoke, £778 at Fenton, and £2046 at Longton. There had been a heavy decline in the income from residuals. The Committee would have to pay considerably more on their coal contracts during the coming year; and they recommended increases of 6d. per 1000 cubic feet in Burslem, Fenton, and Longton, and 7d. in Stoke. Alderman Hayward criticized the proposals for the increases in the various towns. He contended that, on the figures, the price at Burslem should be increased only 5d., while at Stoke it should be increased 9d. The suggested increases were referred back to the Committee for further consideration, on the understanding that they should be adopted temporarily for the next quarter.

## Droitwich Gas-Works Results.

On Monday of last week, the Gas Committee of the Droitwich Town Council had before them the eighth annual report of the Manager (Mr. F. Shewring), which stated that the gas manufactured during the year showed an increase of 1,909,600 cubic feet, or 7·4 per cent. This was the highest increase recorded in any one year since 1900. The sales of gas since 1908 had increased by 59 per cent. The gas unaccounted for was 3·6 per cent., against 3·7 per cent. the previous year. This was an exceptionally small leakage, being the lowest in the history of the undertaking. The profit and loss account showed that the gross profit, after allowing for depreciation, was £1234, leaving a credit balance of £115, against a debit balance last year of £720. Had the expenditure been normal, this year's profit would have been a record, notwithstanding reductions (amounting to 8d. per 1000 cubic feet) in the price of gas, reduced charges for public lighting, free cookers to slot consumers, and lower rental for meters. The gross expenditure for the year, after deduction for depreciation, was £3859 against £4699. The Chairman (Alderman Gabb) characterized the report as highly satisfactory, and, referring to the fact that Mr. Shewring is leaving to take up the Tawe Valley appointment, said the Committee appreciated his work during the last seven years. He had endeavoured to do his duty, and the Committee wished him well in his new sphere. The Committee have determined to give Mr. Shewring a testimonial under the Council's seal.

**Ewden Valley Water-Works.**—An official visit was paid last Thursday afternoon by members of the Sheffield City Council to the water-works in the Ewden Valley. The party travelled by special train, and inspected first of all the workers' village, the features of which Mr. W. Terrey (the General Manager) explained. A visit was then paid to the Broombead storage dam, which will have an impounding capacity of 1050 million gallons, and a maximum depth of 90 feet. Other parts of the works were shown by the Resident Engineer (Mr. Colin Clegg), and before leaving tea was partaken of by the party, which included the Lord Mayor (Mr. O. C. Wilson), the Lady Mayoress, and the Chairman of the Water Committee (Alderman Styring).

# GAS COMPANIES IN THE STOCK EXCHANGE.

The Stock Exchange last week was entirely dominated (some markets quite crushed, might almost be said) by the new War Loan. All the features and the probabilities and possibilities of this great issue have aroused such intense and general interest, and all the pros and cons have daily been discussed so minutely in the whole Press of the country, that it would be beyond our power within the space at our command to present even a fair *résumé*. Suffice it to say, that while the terms of the issue are highly inviting to the investor, its appearance has quite upset the antecedent prices of the highest class securities. These were promptly put down to their minima, and in the case of Consols even the minimum was reduced on Wednesday to 65. Opinions are not unanimous as to what will be the ultimate fate of the conversion terms of the new Loan, and a disagreeable impression is growing that there is a good deal of in-and-out scheming at work which savours more of profit-seeking than patriotism. Taking the week as a whole, business has been very quiet and very dull; some departments being almost in a state of suspended animation. Only among the Miscellaneous and the American Markets was there any redeeming feature. The Gas Market naturally has suffered with the rest, and the array of transactions effected was perhaps never more exiguous. Prices, too, were put down, but not much when the general state of things is considered. In the Money Market, short loans were easy on an abundant supply; but discount rates stiffened considerably in view of the War Loan.

Bargains done for cash during the week were as follows: On Monday, Gas Light ordinary 84⅛, South Metropolitan 92, 92⅜. On Tuesday, British 37½, Gas Light ordinary 84, 84¼, 84⅜, 84½, 85, South Metropolitan 90½, 91. On Wednesday, Continental Union 50, Gas Light ordinary 83⅜, 84, 84¼, 84½, Imperial Continental 65, Primitiva debenture 92, 92½. On Thursday, Gas Light ordinary 83½, ditto maximum 70, 70½, ditto debenture 60½, Imperial Continental 65. On Friday, Gas Light ordinary 83⅜, 84, South Metropolitan 89, San Paulo debenture 90, 90¼. On Saturday, not a single bargain was marked.

Bank rate (fixed Aug. 8), 5 per cent.; last year, 3 per cent.

## LOWEST AND HIGHEST PRICES OF BARGAINS DONE FOR CASH IN THE WEEK ENDING JUNE 26.

| Issue. | Share. | When ex. Dividend. | Dividend or Dividend & Bonus. | NAME. | Closing Prices. July 30. | Yield on Highest Closing Price. | Lowest and Highest Prices of Bargains. |
|---|---|---|---|---|---|---|---|
| £ | | | p.c. | | | £ s. d. | |
| 1,551,868 | Stk. | April 8 | 2½ | Alliance & Dublin Ord. | 59—64 | 3 18 2 | .. |
| 374,000 | ,, | July 10 | 4 | Do. 4 p.c. Deb. | 76—79 | 5 1 3 | .. |
| 280,000 | 5 | April 29 | 7½ | Bombay, Ltd. | 5⅞—6⅜ | 5 17 8 | .. |
| 50,000 | 10 | Feb. 26 | 16 | Bournemouth Gas and Water — 10 p.c. | 29—30 | 5 6 8 | .. |
| 873,480 | 10 | ,, | 7 | Bournemouth Gas and Water — B 7 p.c. | 15—15½ | 4 10 4 | .. |
| 95,000 | 10 | ,, | 6 | Bournemouth Gas and Water — Pref. 6 p.c. | 13½—14 | 4 5 9 | .. |
| — | — | — | — | Bournemouth Gas and Water — Deb. | .. | — | .. |
| 880,000 | Stk. | Feb. 26 | 14 | Brentford Consolidated | 261—266 | 5 5 3 | .. |
| 830,000 | ,, | ,, | 11 | Do. New | 204—209 | 5 5 3 | .. |
| 50,000 | ,, | ,, | 5 | Do. 5 p.c. Pref. | 109—111 | 4 10 1 | .. |
| 206,250 | ,, | June 11 | 4 | Do. 4 p.c. Deb. | 91—93 | 4 6 0 | .. |
| 217,380 | Stk. | Feb. 26 | 11 | Brighton & Hove Orig. | 208—213 | 5 3 4 | .. |
| 244,200 | ,, | ,, | 8 | Do. A Ord. Stk. | 154—159 | 5 0 8 | .. |
| 530,000 | 20 | Mar. 26 | 12½ | British | 44—45 | 5 11 1 | 37½ |
| 120,000 | Stk. | June 26 | 4 | Do. 4 p.c. Deb. Stk. | 88—90 | 4 8 11 | .. |
| 245,771 | Stk. | June 26 | 4 | Buenos Ayres 4 p.c. Deb | 85—87 | 4 12 0 | .. |
| 100,000 | 10 | — | — | Cape Town & Dis., Ltd. | 1½—2½ | — | .. |
| 100,000 | 10 | — | — | Do. 4½ p.c. Pref. | 4—6 | — | .. |
| 100,000 | Stk. | June 26 | 4½ | Do. 4½ p.c. Deb. Stk. | 70—75 | 6 0 0 | .. |
| 157,150 | Stk. | Feb. 26 | 6 | Chester 5 p.c. Ord. | 103—110 | 4 10 11 | .. |
| 1,513,280 | Stk. | Feb. 12 | 5/9/4 | Commercial 4 p.c. Stk. | 106—108 | 5 1 2 | .. |
| 560,000 | ,, | ,, | 5½ | Do. 3½ p.c. do. | 103—105 | 5 1 6 | .. |
| 475,000 | ,, | June 11 | 8 | Do. 3 p.c. Deb. Stk. | 69½—71½ | 4 3 11 | .. |
| 800 000 | Stk. | ,, | 4 | Continental Union, Ltd. | 76—79 | 5 1 3 | 50 |
| 200 000 | ,, | ,, | 7 | Do. 7 p.c. Pref. | 115—118 | 5 18 8 | .. |
| — | — | — | — | Croydon B and C 7 p.c. | .. | — | .. |
| 492,270 | Stk. | — | 6 | Derby Con. Stk. | 123—125 | 4 16 0 | .. |
| 55,000 | ,, | — | 4 | Do. Deb. Stk. | 102—104 | 3 16 11 | .. |
| 1,002,180 | 10 | July 29 | 10 | European, Ltd. | 17½—18 | 5 11 1 | .. |
| 16,362,910 | Stk. | Feb. 12 | 4/17/4 | Gas Light and Coke — 4 p.c. Ord. | 98—102 | 4 15 6 | 83½—85 |
| 2,600,000 | ,, | ,, | 3½ | Gas Light and Coke — 3½ p.c. max. | 76—79 | 4 8 7 | 70—70½ |
| 4,062,235 | ,, | ,, | 4 | Gas Light and Coke — 4 p.c. Con. Pref. | 96—99 | 4 0 10 | .. |
| 4,674,850 | ,, | June 11 | 3 | Gas Light and Coke — 3 p.c. Con. Deb. | 72½—74½ | 4 0 6 | 60½ |
| 130,000 | ,, | ,, | 10 | Gas Light and Coke — 10 p.c. Bonds | .. | — | .. |
| 258,740 | Stk. | Mar. 12 | 5 | Hastings & St. L. 3½ p.c. | 87—89 | 5 12 4 | .. |
| 70,000 | 10 | April 29 | 11 | Hongkong & China, Ltd. | 16½—16⅝ | 6 11 4 | .. |
| — | — | — | — | Hornsey 7 p.c. | .. | — | .. |
| 131,000 | Stk. | Mar. 12 | 7⅞† | Ilford A and C | 151—154 | 5 2 4 | .. |
| 65,780 | ,, | ,, | 6⅜† | Do. B | 115—118 | 5 8 0 | .. |
| 65,500 | ,, | June 26 | 4 | Do. 4 p.c. Deb. | 92—94 | 4 5 1 | .. |
| 4,940,000 | Stk. | May 14 | 9 | Imperial Continental | 150—160 | 5 12 6 | 65 |
| 1,235,000 | Stk. | Feb. 12 | 8½ | Do. 8½ p.c. Deb. Red. | 84—86 | 4 1 5 | .. |
| 200,242 | Stk. | Mar. 12 | 6½ | Lea Bridge Ord. 5 p.c. | 119—121 | 5 7 5 | .. |
| 561,000 | Stk. | Feb. 26 | 10 | Liverpool 5 p.c. Ord. A | 211—213 | 4 13 11 | .. |
| 718,100 | ,, | ,, | 7 | Liverpool 5 p.c. Ord. B | 146—14 | 4 14 7 | .. |
| 306,083 | ,, | June 26 | 4 | Do. 4 p.c. Pr. Deb. Stk. | .. | — | |

| Issue. | Share. | When ex. Dividend. | Dividend or Dividend & Bonus. | NAME. | Closing Prices. July 30. | Yield on Highest Closing Price. | Lowest and Highest Prices of Bargains. |
|---|---|---|---|---|---|---|---|
| £ | | | p.c. | | | £ s. d. | |
| 75,000 | 5 | June 11 | 6 | Malta & Mediterranean | 4⅛—4⅜ | 6 9 9 | .. |
| 250,000 | 100 | April 1 | 4½ | Met. of Melbourne — 4½ p.c. Deb. | 99—101 | 4 9 1 | .. |
| 541,930 | 20 | May 28 | 4 | Monte Video, Ltd. | 11⅛—12 | 6 13 4 | .. |
| 1,775,892 | Stk. | July 29 | 4½ | Newc'tle&G'tesh'd Con. | 98½—99½ | 4 10 6 | .. |
| 529,705 | Stk. | June 26 | 3½ | Do 3½ p.c. Deb. | 82—83 | 4 4 10 | .. |
| 55,940 | 10 | Feb. 26 | 7/14.0 | North Middlesex 7 p.c. | 14—15 | 5 2 8 | .. |
| 300,000 | Stk. | May 14 | 8 | Oriental, Ltd. | 117—122 | 6 11 2 | .. |
| 60,000 | 5 | Mar. 26 | 10 | Ottoman, Ltd. | 7⅛—7⅜ | 6 9 0 | .. |
| 60,000 | 50 | Feb. 26 | 13 | Portsea, Island B | 128—131 | 4 19 3 | .. |
| 100,000 | 50 | ,, | 19 | Do. C | 118—121 | 4 19 2 | .. |
| 52,000 | 50 | ,, | 10 | Do. D | .. | — | .. |
| 249,980 | 5 | April 29 | 6 | Primitiva Ord. | 5⅛—6 | 6 18 4 | .. |
| 499,960 | 5 | June 26 | 5 | ,, 5 p.c. Pref. | 4⅞—5 | 5 0 0 | .. |
| 521,600 | 100 | June 2 | 4 | ,, 4 p.c. Deb. | 91—93 | 4 6 0 | 92—92½ |
| — | — | — | — | ,, ,, ,, 1911 | .. | — | .. |
| 346,198 | Stk. | June 26 | 4 | River Plate 4 p.c. Deb. | 85—87 | 4 12 0 | .. |
| 150,000 | 10 | May 14 | 6 | San Paulo — 6 p.c. Pref. | 10½—11 | 5 9 1 | .. |
| 125,000 | 50 | July 1 | 5 | San Paulo — 5 p.c. Deb. | 47—49 | 5 2 0 | 90—90¼ |
| 135,000 | Stk. | Mar. 12 | 10 | Sheffield A | 223—224 | 4 9 3 | .. |
| 209,984 | ,, | ,, | 10 | Do. B | 222—224 | 4 9 3 | .. |
| 523,500 | ,, | ,, | 10 | Do. C | 220—222 | 4 10 1 | .. |
| 90,000 | 10 | May 28 | 9 | South African | 10½—11½ | 7 16 6 | .. |
| 6,429,895 | Stk. | Feb. 12 | 5½,0 | South Met., 4 p.c. Ord. | 111—113 | 4 16 8 | 89—92¾ |
| 1,895,445 | ,, | July 10 | 3 | Do. 3 p.c. Deb. | 72½—74½ | 4 0 6 | .. |
| 209,820 | Stk. | Feb. 26 | 8½ | South Shields Con. Stk. | 157—159 | 5 6 11 | .. |
| 952,795 | Stk. | Feb. 26 | 6 | S'th Suburb'n Ord. 5 p.c. | 114—116 | 5 3 5 | .. |
| 60,000 | ,, | ,, | 5 | Do. 5 p.c. Pref. | 110—112 | 4 9 3 | .. |
| — | — | — | — | Do. West Kent. | .. | — | .. |
| 137,058 | ,, | June 26 | 5 | Do. 5 p.c. Deb. Stk. | 116—118 | 4 4 9 | .. |
| 629,740 | Stk. | May 14 | 5 | Southampton Ord. | 99—102 | 4 18 0 | .. |
| 120,000 | Stk. | Feb. 12 | 7½† | Tottenham — A 5 p.c. | 135—138 | 5 8 8 | .. |
| 742,275 | ,, | ,, | 6† | Tottenham — B 3½ p.c. | 115—117 | 5 2 7 | .. |
| 181,255 | ,, | June 26 | 4 | District — 4 p.c. Deb. | 87—89 | 4 9 11 | .. |
| 182,380 | 10 | Dec. 30 | 5 | Tuscan, Ltd. | 5—6 | 8 6 8 | .. |
| 149,900 | 10 | July 1 | 5 | Do. 5 p.c. Deb. Red. | 93—95 | 5 5 3 | .. |
| 236,476 | Stk. | Mar. 12 | 5 | Tynemouth, 5 p.c. max. | 108½—109½ | 4 11 4 | .. |
| | | | | Wandsworth, Wimbledon, and Epsom— | | | |
| 30,000 | Stk. | Feb. 26 | 8⅜ | Wandsworth A 5 p.c. | 151—156 | 5 7 4 | .. |
| 255,636 | ,, | ,, | 6⅜ | ,, B 3½ p.c. | 129—134 | 5 2 7 | .. |
| 108,075 | ,, | ,, | 5/17/3 | ,, C 3½ p.c. | 110—115 | 5 2 0 | .. |
| 352,000 | ,, | ,, | 6⅛ | Wimbledon 5 p.c. | 117—122 | 5 0 5 | .. |
| 98,000 | ,, | ,, | 6⅜ | Epsom 5 p.c. | 121—126 | 5 5 2 | .. |
| 88,416 | ,, | June 26 | 3 | 3 p.c. Deb. Stk. | 66—69 | 4 6 11 | .. |

## APPLICATIONS FOR LETTERS PATENT.

8765.—Lucas, F. L., "Burners for air and gas." June 14.
8766.—Miles, T. V., and Newton, Chambers, and Co., Ltd., "Gas-scrubbers." June 14.
8830.—Eady, L. H., and Clarke, H. W., "Manufacture of gas." June 15.
8886.—Sifton, W. B., and Harding Bros., Ltd., "Production of toluene." June 16.
8974.—Evered and Co., Ltd., and Pizey, J. C., "Gas and liquid main cocks." June 18.
8986.—Grafton, W., "Gas-fires." June 18.
9043.—Cooke, E. L., "Deflector for burners." June 19.
9048.—Dean, W. T., "Artificial illumination." June 19.

## Lyttelton (N.Z.) Gas Supply.

It is stated in the annual report of Mr. L. A. Stringer (the Town Clerk) that for the year to March 31, the revenue of the Lyttelton (N.Z.) gas undertaking, as per the profit and loss account, was £5657, and the expenditure £4712, leaving a profit of £945, equal to 14·55d. per 1000 cubic feet. The department has again exceeded all previous records in the output of gas, and there has been a further increase in the number of consumers. "These yearly increases in the number of consumers and the output of gas," it is pointed out, "would not be remarkable in a town of normal growth; but the position is very different in Lyttelton. The gas-works have been established nearly forty years, during which period the population of the town has been stationary. New buildings are erected at the rate of about six per year; and these in many cases are to replace old ones. In these circumstances, one wonders where the gas engineer is able to keep pushing in new services." The question of supplying the demand for gas reached a critical point during the year; and the provision of larger mains and improved facilities at the works became imperative. The problem has been temporarily met. Proposals for extensions to the works have, however, had to be held over, pending definite information regarding the suggestion to introduce electricity into the borough. If it is decided to introduce electricity, the gas-works will be relieved for the present; but capital expenditure in either gas or electricity must be met at once. The position has necessitated considerable expenditure on plant, which has been met temporarily out of revenue; but in the event of a loan being raised for gas-works extensions, this expenditure will be refunded to the gas-works account. In his statement, the Gas Engineer (Mr. W. M'Auliffe) says that 35 new services were connected during the year; and the make of gas for the twelve months shows an increase of 11·39 per cent. over that of the previous year. The total make of gas was 17,017,000 cubic feet, or 12,503 feet per ton of coal carbonized. The unaccounted-for gas was 5·78 per cent. The net cost of coal per 1000 cubic feet of gas sold was 4 85d.

**Dearer Gas at Slough.**—The Directors of the Slough Gas and Coke Company have notified consumers that, owing to the increase in the price of coal and other materials, they are compelled to increase the price of gas over the whole of the district 3d. per 1000 cubic feet from the Midsummer quarter. This will make the charge 3s. 9d.

## Chorley Gas Prices Increased.

At the last meeting of the Chorley Gas Committee, it was reported that, owing to the increased charges for coal and decreased yield from residuals, the prices of gas to both ordinary and prepayment meter consumers would have to be re-considered. At a meeting of the Town Council last week, it was reported that the Committee's recommendation was that from July 1 the price of gas to ordinary consumers should be increased by 6d. per 1000 cubic feet; that prepayment consumers within the district be supplied with 24 cubic feet for 1d., as against 26 feet allowed at present; and that prepayment consumers outside the district be allowed 22 cubic feet for 1d. In moving an amendment, that the increase should be only 3d. per 1000 feet, Mr. Sandham pointed out that in the past ten years £17,700 had been taken from gas profits for the relief of the rates, and remarked that it was time the rates did something for the gas consumers. He suggested that if there was any deficit it should be made good out of the depreciation fund. Mr. E. W. Heald (the Chairman of the Gas Committee) pointed out that the extra coal cost alone amounted to about £4000, and hinted, on the estimates before him, at a possible deficit. With regard to Mr. Sandham's remarks as to the depreciation fund, this was almost entirely ear-marked for renewal purposes. The amendment found no seconder; and the increases suggested were passed.

At the annual meeting of the Okehampton Gas Company, a dividend of 4 per cent. was declared. It has been decided to increase the price of gas 5d. per 1000 cubic feet, bringing it to 5s.

Mr. J. W. Ison, who has been for many years engaged in the gas-stove business, both in this country and abroad, has been appointed London representative (No. 129, High Holborn) of the Parkinson Stove Company, Limited.

The Loughborough Corporation have decided to increase the wages of employees in the Gas and Electricity Departments by 2s weekly, in the case of those receiving 30s. and under 32s. who are married men or single men over military age and ineligible for military service.

The Middlesbrough chemical-works of Messrs. Sadler and Co. were last Friday week the scene of a fire, which broke out at the tar-stills and a tar-tank. Besides this, only one building (used as a laboratory and stores) was involved; and the damage done was not of very serious extent—the fire being got under within about half-an-hour.

In last week's issue, the formation was notified of a private company under the title of "Smith Meters Limited." It is interesting to learn that the meter manufacturing business acquired was founded by William Smith as long ago as 1834, at Snow Hill, E.C., and carried on by him and his successors under the trading name of William Smith, in Kennington Park Road, from the year 1860.

The Stores and Contracts Committee of the London County Council have made special arrangements with the Gas Light and Coke Company and the South Metropolitan Gas Company for supplies of coke. The prices will be based on the market rates current from time to time. In the case of the districts for which supplies will be obtained from the Commercial Gas Company through Messrs. M. Abbott and Sons, an offer of the firm has been accepted to deliver coke at the price of 30s. 6d. a ton, to be varied from time to time in accordance with increases or decreases of the yard price of the Gas Company.

## WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

### Appointments Wanted.

Chemist and Works Assistant. No. 6056.

### Appointments, &c., Vacant.

Assistant Works Superintendent. Rochester, &c., Gas Company. Applications by July 1.
Assistant-Manager. No. 6059.
Draughtsman. Halifax Gas Undertaking. Applications by July 3.
Assistant Draughtsman. Derby Gas Company.
Technical Salesman (Industrial Gas Appliances). No. 6054.
Foreman. Rochester, &c., Gas Company.
Prepayment Meter Collector. Aldershot Gas, &c., Company.

### Plant, &c. (Second Hand), for Sale.

Exhausters, Engines, Boilers, &c. Bristol Gas Company. Tenders by July 8.
Manual Charging Machines. Weston-super-Mare Gas Company.

### Plant, &c. (Second Hand), Wanted.

Valves. No. 6053.

### Meeting.

Commercial Gas Company. Cannon Street Hotel. Aug. 5. Twelve o'clock.

### Patent Licence.

Atmospheric Gas-Burners. Browne and Co., Warwick Court, Holborn.

### Sales of Stocks and Shares.

Reading Gas Company. By Tender, July 14.

### TENDERS FOR

**Coal.**

Radcliffe and Pilkington Gas Company. Tenders by July 2.
Rotherham Gas Department. Tenders by July 14.

**Tar and Liquor.**

Rotherham Gas Department. Tenders by July 14.

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SPENT OXIDE PURCHASED IN ANY DISTRICT.

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See Illustrated Advertisement, May 11, p. 314.

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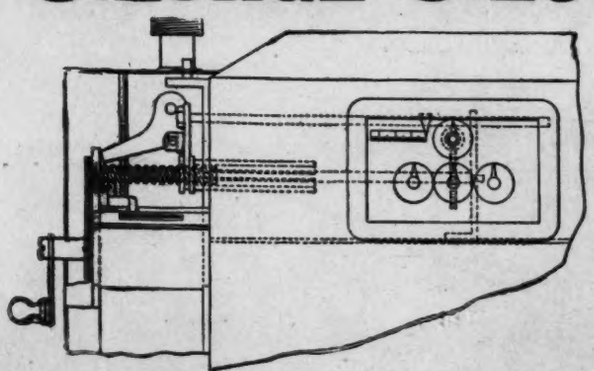
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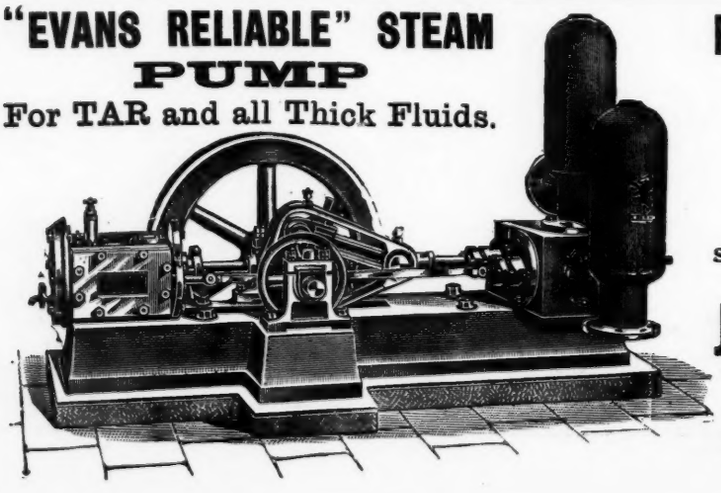

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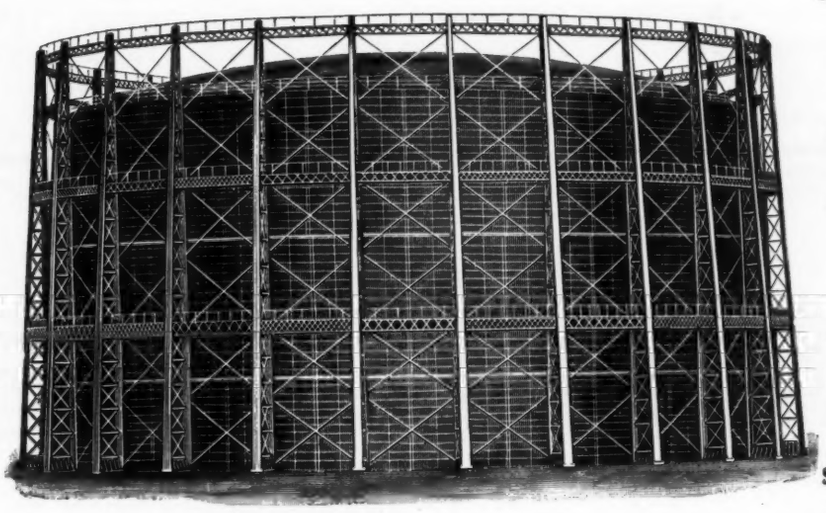

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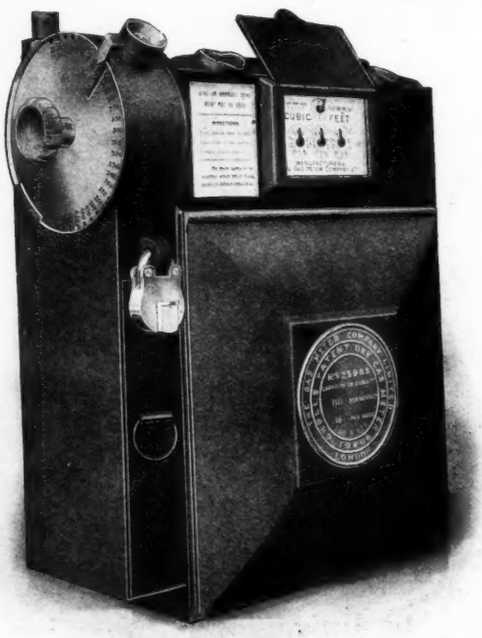

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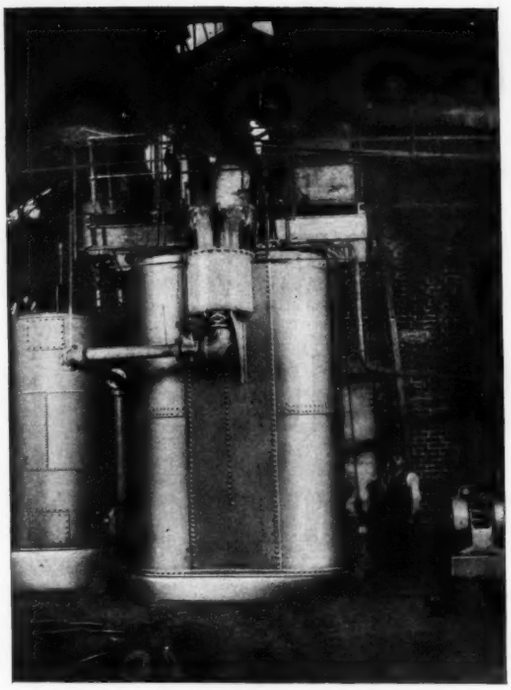

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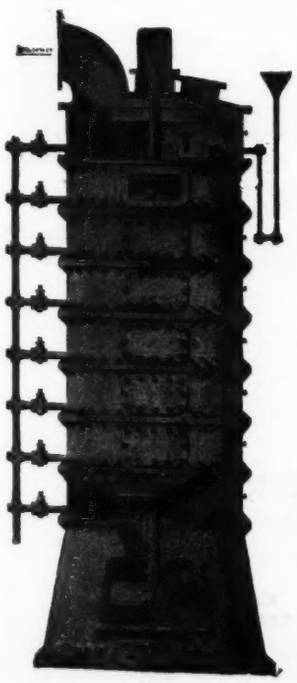

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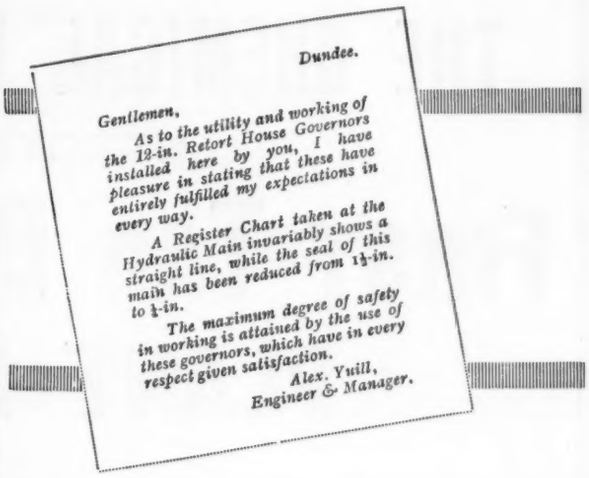

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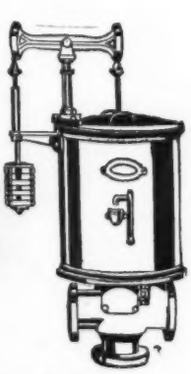

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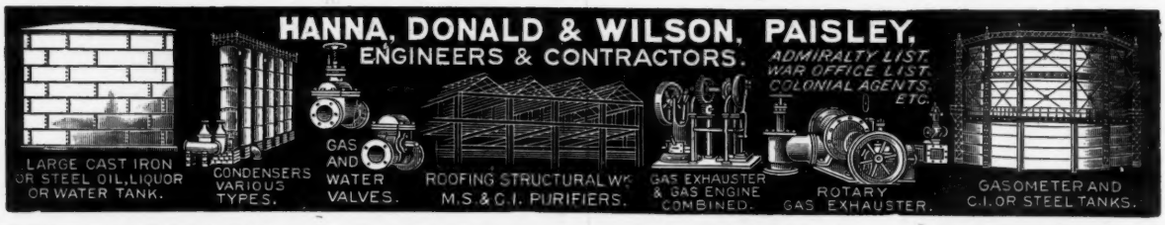
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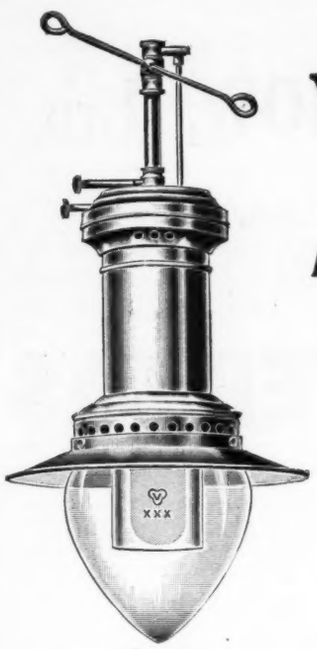

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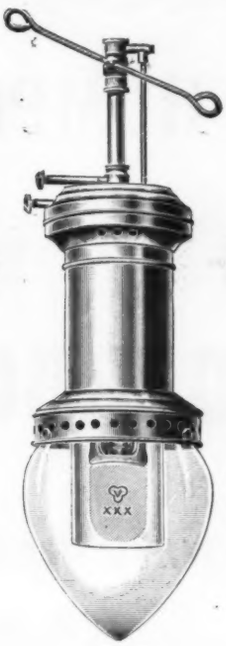

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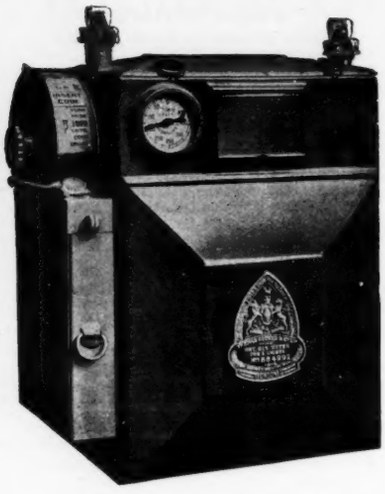

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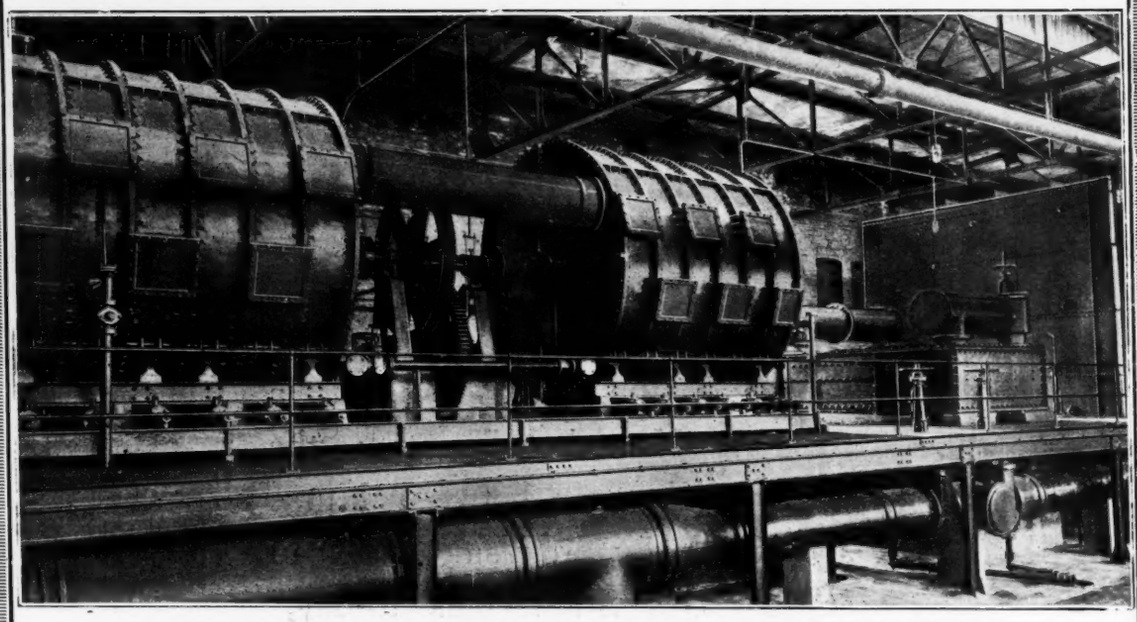

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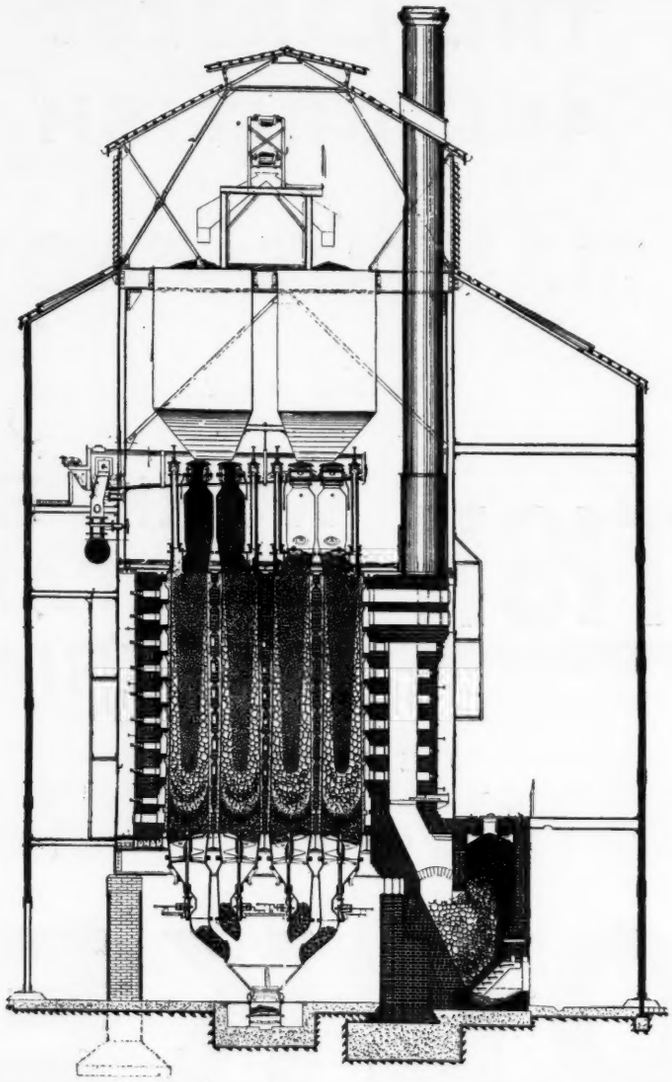

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**THE Directors of the above Company** invite Applications for the Position of ASSISTANT WORKS SUPERINTENDENT of their Gillingham Station. Applicants must have a thorough knowledge of Gas Manufacture, and Experience of Vertical Retorts is essential. Salary, £150 per Annum.

Applications, stating Age, Qualifications, and Experience, accompanied by *copies* of not more than Three Testimonials, and endorsed "Assistant," should be sent to the undersigned not later than Twelve Noon on Thursday, the 1st day of July, 1915.

C. VALON BENNETT,
Engineer and General Manager.

Gas Offices, 95, High Street, Rochester,
June 17, 1915.

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W. B. M'LUSKY,
Engineer and Manager.

Gas-Works, Halifax.

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**WANTED—Assistant Draughtsman.** Gas-Works Experience preferred, but not necessary.

Apply, stating Age, Experience, and Salary required, ot the DERBY GASLIGHT AND COKE COMPANY.

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Tenders, sealed and endorsed "Tender for Gas Plant," must be Delivered to the undersigned at the Colston Street Office, Bristol, not later than Thursday, the 8th day of July next.

JOHN PHILLIPS,
Secretary.

Chief Offices, Colston Street,
Bristol, June 22, 1915.

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**RADCLIFFE AND PILKINGTON GAS COMPANY.**

**THE Directors invite Tenders for a** Twelve Months' Supply of their Requirements of GAS COAL.
Forms of Tender may be obtained from the undersigned, by whom Tenders, properly endorsed, will be received until Friday morning next, the 2nd day of July.
JAMES BRADDOCK,
Manager and Secretary.
Gas Offices, Radcliffe, near Manchester, June 24, 1915.

**COUNTY BOROUGH OF ROTHERHAM.**

**THE Gas Committee invite Tenders** for the Supply and Delivery, at the Gas-Works, Rotherham, of such Quantities of COALS and NUTS as may be required during the ensuing year.
Forms of Tender may be obtained on Application to Mr. J. S. Naylor, Engineer and General Manager, at the Gas-Works
Sealed Tenders to be sent to me not later than the 14th of July, 1915, endorsed "Tender for Coal."
By order,
CHAS. L. DES FORGES,
Town Clerk.
Town Hall, Rotherham, June 26, 1915.

**COUNTY BOROUGH OF ROTHERHAM.**
(GAS DEPARTMENT.)

**THE Corporation of Rotherham are** prepared to receive OFFERS for the Purchase of the Surplus GAS TAR and AMMONIACAL LIQUOR produced at their Gas-Works during the ensuing Year.
Forms of Tender and Specifications may be obtained on Application to Mr. J. S. Naylor, Gas Engineer.
Offers, endorsed "Gas Tar and Ammoniacal Liquor," to be sent to me not later than July 14 next.
CHAS. L. DES FORGES,
Town Clerk.
Town Hall, Rotherham, June 26, 1915.

**SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.**

**MESSRS. A. & W. RICHARDS beg to** notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.
Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 37, WALBROOK, E.C.

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(INCORPORATED BY 25TH AND 26TH VIC., CAP. 84, 30TH OF JUNE, 1862.)

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**THE Directors invite Tenders (at** not less than £102 per £100 Stock) for £7500 ORDINARY STOCK in the above-named Company, to be raised in pursuance of the powers of "The Reading Gas Act, 1902."
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This Stock will rank for a maximum dividend of 5 per cent. per annum. Full dividends on the Company's Stocks and Shares have been paid since its incorporation in 1862.
The Stock will be issued in amounts of not less than £10 or multiples thereof, and will be registered in the names of the purchasers (or their nominees) free of expense.
Payment for the Stock is to be made by the 31st of July, 1915; but the dividend will accrue from July 1.
The dividends are paid half yearly, on the 1st of March and 1st of September.
The Liability of the Stockholders is Limited—that is, when the Stock is paid for there is no further Liability
Particulars, with Forms of Tender, may be obtained on Application to the Secretary, to whom Tenders must be Delivered not later than Wednesday, July 14, 1915.
By order of the Directors,
A. B. STEDMAN,
159, Friar Street, Reading, June 15, 1915. Secretary.

**THE GASLIGHT AND COKE COMPANY.**

**NOTICE is Hereby Given that the** TRANSFER BOOKS of this Company, SO FAR AS THEY RELATE TO CAPITAL STOCKS, WILL BE CLOSED at Four o'clock p.m. on Tuesday, the 6th day of July next, and WILL BE RE-OPENED immediately after the Half-Yearly Ordinary General Meeting of the Company, to be held on Friday, the 6th day of August next.
By order,
HENRY RAYNER,
Secretary.
Chief Office: Horseferry Road, Westminster, S.W., June 24, 1915.

**COMMERCIAL GAS COMPANY.**

**NOTICE is Hereby Given that an** ORDINARY MEETING of the Commercial Gas Company will be holden at the Cannon Street Hotel, in the City of London, on Thursday, the 5th of August, 1915, at Twelve o'clock at Noon, to receive the Directors' Report and the Accounts of the Company for the Half Year ended the 30th of June, 1915; and to declare a Dividend.
The STOCK TRANSFER BOOKS WILL BE CLOSED from the 6th of July to the 5th of August, both days inclusive; and the Dividends will be paid on the 16th of August next to the holders of Stock registered at the date of the closing.
By order of the Board,
F. J. BRADFIELD,
Offices: Stepney, June 28, 1915. Secretary.

**THE Proprietor of Letters Patent No.** 9610, of 1911, for "IMPROVEMENTS IN AND RELATING TO ATMOSPHERIC GAS AND LIKE BURNERS," is Desirous of entering into arrangements, by way of a LICENCE or otherwise, upon Reasonable Terms, for the purpose of EXPLOITING the above Patent and ensuring its Practical Working in Great Britain. All Communications should be addressed to BROWNE AND CO., Patent Agents, 9, Warwick Court, Holborn, LONDON.

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## REPORTS OF DISTRICT GAS ASSOCIATIONS FOR 1914.

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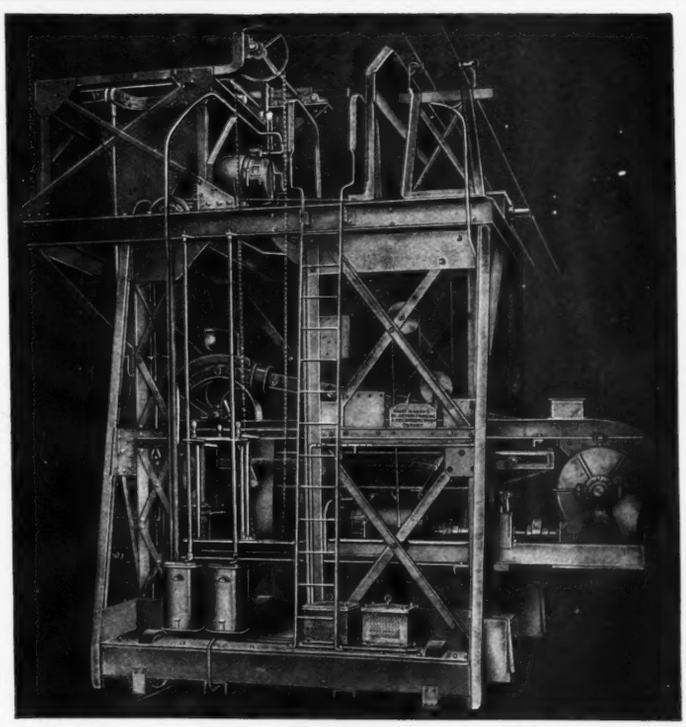

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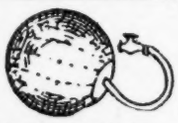

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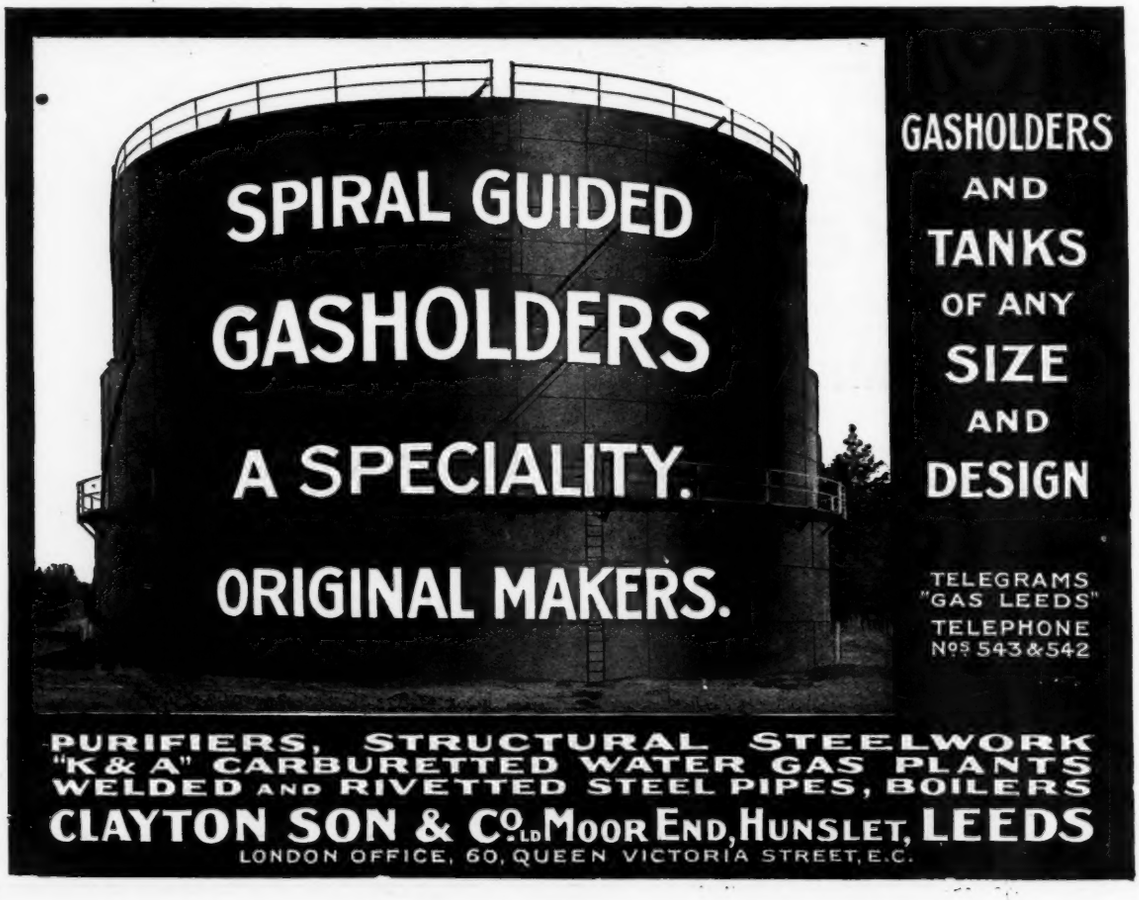
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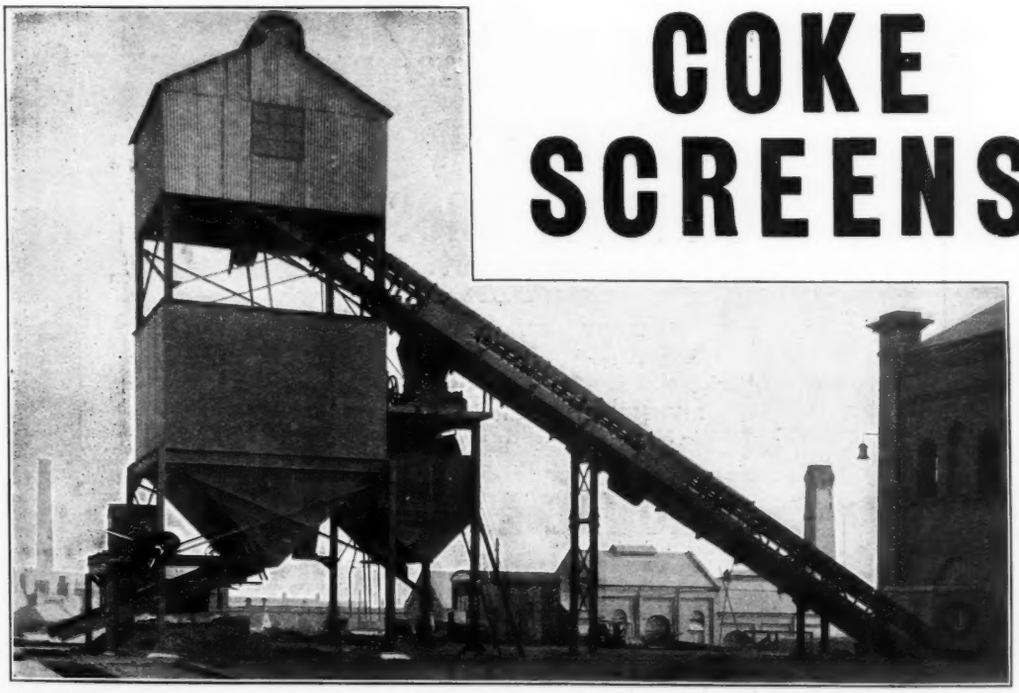

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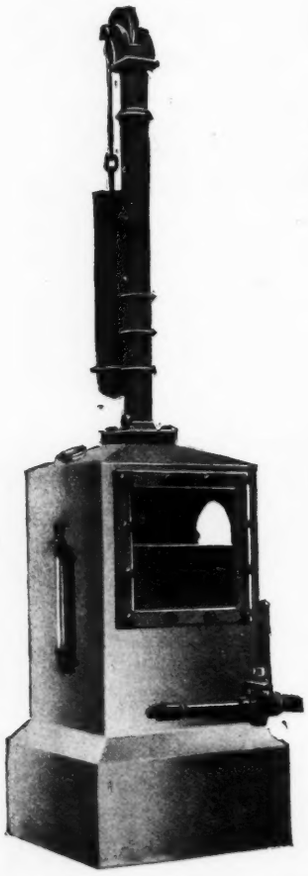

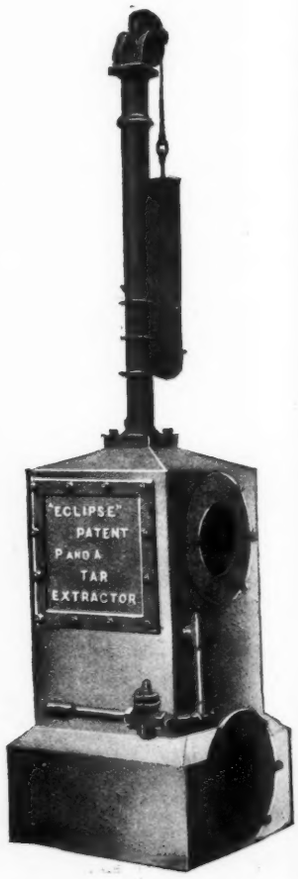


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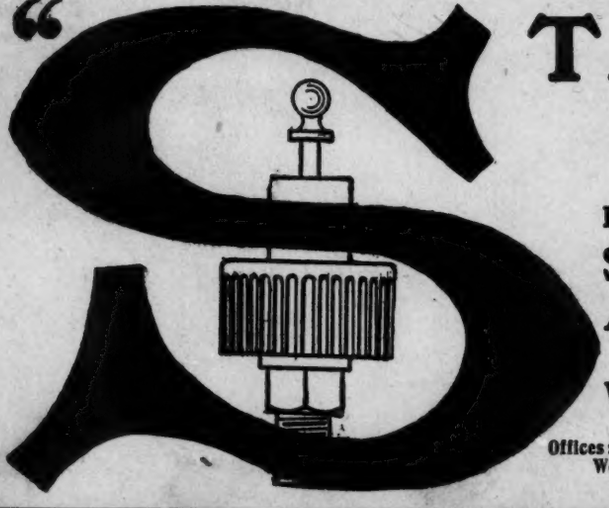

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